INDIANAPOLIS MAY 19 1900 PUBLIC LIBRARY

AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION

VOLUME 23 — NEW YORK AND LONDON — NUMBER 20

Published at 218 William St., New York,
Every Thursday by the

American Machinist Press.

[INCORPORATED.]

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A. LEIGHTON DONNELL, Sec'y.

Also published at 34 Norfolk St., Strand, London, W. C.,
Every Saturday.

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Correspondence on mechanical subjects solicited. Name and address must always be given—not necessarily for publication.

Address all business communications to the American Machinist Press. Matter for reading columns may be addressed to the Editor.

Subscribers can have address changed at will. Give old and new addresses. Date on wrapper denotes end of month in which subscription expires.

Subscription Price:

$3 per year in advance, postage paid, in North America.
$4 per year in foreign countries, postage prepaid.
No back numbers beyond current year.
For sale by newsdealers, generally.

AMERICAN MACHINIST CO., Ltd.,
34 Norfolk St, Strand, London, W. C.

ADPHE. JANSSENS, Ingr.,
16 Place de la République, Paris.
10 A Boulevard Barthélemy, Bruxelles.

V. LOWENER,
Copenhagen,
Representative for Denmark, Norway and Sweden.

GUSTAV DIECHMANN & SOHN,
Neue Promenade 4, Berlin,
Representatives for Germany, Austria and Holland.

Entered at New York P. O. as second-class mail matter.

Cable address, "MACHINIST," N. Y.
Lieber's and A B C Codes.

The Age of the Cookson Gun.

The story of a remarkable old gun told by Mr. Parkhurst in another column will, we have no doubt, be read with deep interest by our readers. In order that the engravings might be made direct from the gun, without the necessity of retouching or copying, Mr. Brooks, the owner of the gun, brought it to our office, where it was put before the camera to have its picture made. This gave us a highly cherished opportunity to examine the old relic, and we can do neither more nor less than corroborate all that Mr. Parkhurst has said in its praise.

The question will present itself to all—how are we to feel satisfied that the gun is not an "imitation antique," gotten up with intent to deceive? Such a question cannot be answered positively of course, but all reasonable inference leads to the conclusion that the relic is what it purports to be—a genuine antique. The artistic embellishments of the gun indicate most clearly that its making was a labor of love and not of deception. The labor involved in thus carving (for no other word will answer) the mass of relief decoration from the solid metal must have been simply enormous. Does anyone suppose for a moment that the maker of an imitation antique would assume all this (for his purpose of deception) useless labor? The same argument applies to other features in which great labor is manifest for no other purpose than the desire to do a superb piece of work. Thus notice the battle axe, or, as Mr. Parkhurst describes it, Turkish crescent sight at the muzzle. It will be seen that this sight, which stands about an inch from the barrel, is mounted on the barrel by a slender stem. Now, barrel, sight and stem are *in one piece*. Is this conceivable if the gun were made to deceive? Again, if not an antique, the gun was most probably made some time before the civil war, and at that period it would have been remarkable as an invention alone. Inventors were not then making breech-loading, much less magazine, guns, and even at that date the gun would have been far in advance of its time, and possible only at the hand of a mechanic of remarkable ability. At that time guns were not made with such artistic embellishments any more than they are to-day; but, more than this, is it supposable that the inventor of such a meritorious device would deliberately disown it and ascribe it to a forgotten mechanic of a long-past generation, in order to deceive someone? The manner in which the gun began its known history in the search of the United States Provost Marshall is not inconsistent with the theory of deception; but, remembering that the gun was found on Union soil, is it conceivable that its owner would have allowed it to remain unclaimed in a scrap-heap for years, and finally to pass out of his possession for a trifle (fifty cents, we understand), in case it had been a recent product or in case he had realized its value as an old one?

All these considerations, and others of a similar nature that might be given, point to the conclusion that the gun is a real antique relic. Of its actual date we have no clew except that engraved upon it. Granting the gun to be a genuine antique, this date is inherently as probable as a more recent one; but doubtless someone versed in antiquarian lore, as related to ornamentation, could do something to substantiate or refute it.

Official Tests of Armor Plate.

We have more than once taken occasion to remark upon the apparently different results of the official tests of armor plate and of projectiles. It has seemed to make all the difference in the world as to the result of any given test whether it was the armor or the projectile that was being tested, and with whichever at the time the responsibility rested, it would seem to be equal to the occasion. When armor is to be tested it successfully resists the projectile, and when the projectile is to be tested it pierces the armor with ease. This has seemed to the uninitiated so absurd that the suggestion of dishonesty or collusion has been almost inevitable. There may have been no dishonesty in the matter, or certainly less of it than the visible circumstances have seemed to indicate. The recent reported piercing of a 14-inch armor plate by a 6-inch shell has made the occasion for additional enlightenment upon this matter, and what has much semblance of truth and inside knowledge we find in a recent Washington letter of an able correspondent of the New York "Times." Writing under date of May 9, he says, quoting the words of "a high official of the Ordnance Bureau":

"Something has been learned by the tests made with the Krupp armor at Indian Head, and it is of importance. The net result of the experiments is to confirm naval officers in their estimate of velocity as the prime element in the successful destruction of armor plate, and to prove that an old invention which has been in use by the Navy Department for years is a very good shell indeed.

"The tests were made with a Johnson soft-nose shell. It has been tested often, and it is regarded as one of the best shells ever invented. The only new thing in the experiment is that the Johnson soft-nose shell has never been tried on Krupp armor before, because the Navy Department had no Krupp armor to try it on.

"There has been a superstition among people who do not know much about ordnance that a kind of armor had been or could be invented which could not be pierced. Ordnance experts have tried in vain to dissipate this delusion, and have now given up the attempt and smile at it.

"There is no use in trying to upset that belief, but nobody who is at all posted on the matter has entertained it. People who understand such things never supposed that an armor had been invented which could not be shattered, and the experiments with the Krupp plate are no sur-

prise. But to make that a ground for saying that all armor plate is alike, and that the poorest is as good as the best, is simply absurd.

"The test made with the Johnson shell does not prove that it is the only shell which can pierce Krupp armor. Krupp armor cannot be cracked, but it can be perforated, and this was done with the Johnson shell. It is the practice to perform all official tests with uncapped shells. This is because the manufacturers are required to submit to a fair test, and there is not a manufacturer in the world who will allow his goods to be officially tested with a capped shell. It is not considered a fair test.

"But after the official test has been made with the uncapped shell, it is often the practice to experiment with a capped shell, not at all for the purpose of testing the armor, but to give the Navy Department an idea of the effects produced by a shell with a cap, as distinguished from that produced by a shell with no cap. This practice was followed in the case of the Krupp plate. *The test made with the uncapped shell was satisfactory as to the strength of the armor. The damage inflicted was slight. Then the soft-nose cap was tried, and the armor was perforated.*

"But this is so much in the line of what was expected that it is not the main factor in the interest of naval officers in the test. The point which interests them is that the shell was fired with more than the usual velocity. Most people have no idea of the importance of a little additional velocity. Fifty feet make all the difference in the world. In this case the velocity was 25 per cent. above the ordinary, and Krupp armor or any other armor could be perforated without the use of the Johnson cap if sufficient velocity were attained.

"Shells do not always strike plumb in the center of a plate. That can be arranged when an official test is under way, but not always when the target is a ship rolling in a heavy sea. The shell may strike obliquely, and in such a case it would make all the difference in the world whether the armor was of the best quality or of the poorest. But that an armor plate can be devised which, presenting a fair mark and struck squarely, can never be punctured, is a popular delusion which does not obtain among naval officers. They have no idea that the soft-nose shell is the only one which can penetrate Krupp armor."

In other words, it is the possible and not the impossible that is to be insisted upon in the tests. There is still armor plate and armor plate, and if we cannot find the impenetrable and the indestructible we can at least try for that which shows the most endurance. There can be little doubt that the projectile must inevitably hold the lead. The limits of armor afloat must be nearly attained, while no one can say the same so certainly of the velocity of the projectile.

Civil Service Examinations for Government Positions.

The United States Civil Service Commission announces examinations to be be held in any city in the United States where it has a local Board of Examiners, for the following positions:

June 18, 19, 20, for the position of marine engine draftsman. The Department states that for this position it desires a man who is a marine engine draftsman and who has had several years' experience as such in marine engine building establishments, and one who is familiar with the best and most recent practice in engine and boiler construction, and who is also able to make all calculations necessary in working out the design of details in steam machinery. From the eligibles resulting from this examination certification will be made to the position of draftsman, marine engines, in the Bureau of Steam Engineering, Navy Department, at a salary of $1,400 per annum.

From the eligibles resulting from this examination certification will be made to the position of mechanical draftsman, Ordnance Department, War Department, at a salary of $1,200.

June 25, 26, 27, for the position of draftsman of marine engines and machinery. From the eligibles resulting from this examination certification will be made to the position of draftsman in the office of the United States Inspector of Machinery at Weymouth, Mass., at a salary of $4 per diem.

June 28, 29, 30, for the position of mechanical draftsman. From the eligibles resulting from this examination certification will be made to the position of mechanical draftsman at the League Island Navy Yard at a salary of $4 per diem.

These examinations will consist of the subjects mentioned below, which will be weighted as follows:

(1) Letter-writing	5
(2) Mathematics	15
(3) Materials	15
(4) Calculations	20
(5) Drafting	25
(6) Technical education and experience	20
Total	100

The examinations will be divided as follows: First day, the first three subjects; second day, the fourth subject; third day, the fifth subject. Age limit, twenty years or over.

July 5, 6, 7, for the position of ship draftsman and assistant ship draftsman. Information relative to the scope of this examination may be found in section 57 of the Manual of Examinations revised to January 1, 1900. From the eligibles resulting from this examination certification will be made to the following named positions: Second-class draftsman, Mare Island Navy Yard, salary $4.56 per diem; draftsman in charge, Portsmouth (N. H.) Navy Yard, salary $6 per diem; assistant ship draftsman, Crescent Ship Yard, Elizabeth City, N. J., salary $4 per diem; assistant ship draftsman, Norfolk Navy Yard, salary $4 per diem; second-class ship draftsman, at Norfolk, at $4 per diem.

These examinations are open to all citizens of the United States who comply with the requirements and desire to enter the service. All such persons are invited to apply, and applicants will be examined and graded with entire impartiality and wholly without regard to any consideration save their ability as shown by the grade attained in the examinations. Persons who desire to compete should at once apply to the United States Civil Service Commission, Washington, D. C., for application forms 304 and 375, which should be properly executed and promptly filed with the Commission.

Work of the International Association for Testing Materials.

We have received from Mr. J. M. Porter, secretary of the Publication Committee, bulletins Nos. 8 to 18 of the American Section of the International Association for Testing Materials, including the report of Committee No. 1, appointed "to establish international rules and specifications for testing and inspecting iron and steel." Bulletins from No. 8 to 17 form proposed standard specifications for different materials of construction, as follows:

8. Structural Steel for Bridges and Ships.
9. Structural Steel for Buildings.
10. Open Hearth Boiler Plate and Rivet Steel.
11. Steel Rails.
12. Steel Splice Bars.
13. Steel Axles.
14. Steel Tires.
15. Steel Forgings.
16. Steel Castings.
17. Wrought Iron.

Bulletin No. 18 contains the report of Committee No. 1 and shows how the various specifications have been drawn up after consultation with leading engineers, railroad companies and manufacturers. These proposed specifications are to be discussed at the autumn meeting of the association. The association works in harmony with the regular engineering societies, and the various specifications are to be discussed by them.

With these bulletins is also bulletin No. 4, containing the annual address of the president of the American section—Professor Mansfield Merriman—in which the history of the association and the scope of its work are given.

The association is in a flourishing condition as regards membership, having now about 2,000 members distributed among thirteen countries.

Commercial Review.

NEW YORK, SATURDAY EVENING,
May 12, 1900.

Attention is called to the commercial notes on foreign trade prepared from various sources of information, which for convenience are placed in the back part of this paper. Exporting manufacturers may find in them some points of practical value in securing trade, as well as of interest.

ENGINEERING MACHINERY TRADE NOTES.

A tour of investigation undertaken at the close of this week to ascertain the condition of the engine market resulted in an impression of trade more favorable than had really been anticipated. The amount of engineering work to be estimated upon is regarded as abundant, notwithstanding sellers' present ideas of what constitutes a big inquiry were cast in the mold of 1899. These inquiries are not resulting in numerous contracts for all offices, which is laid to the charge of luck or of the still crowded condition of the home factory, and is said to be attributable in some cases to a standoff on the part of buyers, who think they may obtain concessions in price if they wait. This disposition is natural enough in view of the weakness of values in certain branches in the iron trades market, which casts suspicion upon all. However, as far as engine prices are concerned, the market feels as solid as an armor plate, and buyers will have to use some phenomenally hard-nosed projectiles if they want to pierce it. One engine company is even understood to have made some advance on certain lines in the last month.

With boilers the case is not the same as with engines. There has been some cutting in prices at least on the fire-tube type, which is distinctively a function of the material market. Such sellers of water-tube boilers as have been consulted deny that they have made any reduction, nor, it would appear, have makers of the fire-tube ones as a unit.

The Payne Company, at Elmira, N. Y., builders of the Payne high-speed engine, suffered the loss of their main machine shop building by fire about a month ago. They have already rebuilt it to such an extent that they are running with about three-fourths of their force, and expect in sixty days to be able to take care of their trade as usual.

The Ames Iron Works are experiencing no diminution of demand. They have been having a notably good export trade of late, which has resulted in extensive shipments of automatic engines for electric lighting to their Paris representative. Mexico has also been buying freely, but the demand from that country is of a different character. The plain slide valve engines, together with boilers, are wanted there for general industrial purposes. The boiler shop of the Ames Works has now been run on double time for about a year.

The Abendroth & Root Manufacturing Company is sending three 150 horse-power water-tube boilers to Mexico. The company is, as usual, doing a good deal of work with its specialty, spiral riveted pipe. A contract for ten miles of 4-inch pipe, galvanized, is being filled for a mining camp at Congress, Ariz.

The Empire Engine & Motor Company, Orangeburg, N. Y., have recently made another installation of hoists at the Navy Yard, Norfolk, Va. They state that the prospects for this year's business in their line are the best that they have yet had, as they are at present experiencing an unprecedented demand for their Empire air tools.

A steam turbine of 2,500 nominal horse-power, though it will probably give as much as 3,000, has been constructed and is being tested at the works of the Westinghouse Machine Company. It is intended for the United Electric Light & Power Company, New York City. The electrical generating end was built by the Westinghouse Electric & Manufacturing Company. This turbine is said to be the largest ever constructed. In building it there was a very nice trick of adjustment in the angles of stationary and moving blades. The construction of steam turbines has progressed to such an extent that the latest problem that has had to be overcome has been the adaptation of the accompanying generator of low voltage to the high speed at which it would be turned by the mechanical apparatus.

A fifth 2,500 horse-power steam engine has been ordered by the Metropolitan Electric Supply Company, of London, England, to be built by the Westinghouse Machine Company. A Westinghouse dynamo has also been ordered. They will be installed at Willesdon.

The New York Air Compressor Company has received an order for a large duplex air compressor, to be used in connection with the Standard Railway Signal Company's installation on the New York Central & Hudson River Railroad. It is the first of two to be placed in the engine room of the Grand Central Station.

A movement is in progress having for its object the development of the water power of the Des Moines Rapids of the Mississippi River, contiguous to the cities of Keokuk, Ia., and Hamilton, Ill. A company has been formed, called the Keokuk & Hamilton Water Power Company, composed of residents of these two towns, having for president Charles P. Birge, of Keokuk, and it has issued a prospectus. It is thought that there may profitably be installed an electrical system for the distribution of current to neighboring towns, including Quincy, Ill., and Burlington, Ia.

The National Metal Trades Association was in session in this city all this week. From what we have heard of the results of the meetings there seems to be a fair prospect that a basis of agreement with the workmen will be reached. It is said indeed that the general principle of compulsory arbitration is accepted by the leading spirits on both sides. If this is so, it will be the more deplorable if matters of detail or minor questions prevent an amicable settlement, averting the calamity toward which machinery trades are drifting.

"A complete line of catalogs and best prices" is a request made by the majority of inquirers from abroad, according to a machinery builder who has a good deal of foreign correspondence. This demand on their part he characterizes as absurd, and remarks that strangers asking for full catalogs and "best prices" are not likely to get either, especially when they neither give references nor indicate what special line they are interested in.

NEW ELECTRICAL MANUFACTURE IN EUROPE.

A plant for the manufacture of dynamos of 2 to 1,200 horse-power and other electrical apparatus is being erected at Moscow, Russia, by the Compagnie Centrale d'Electricité de Moscou. This corporation was founded at Liège, France, four years ago, the Compagnie Internationale d'Electricité and M. Nicolas Vetter, a Moscow merchant, being interested. It has lately increased its capital to $2,000,000 to prosecute the new enterprise. It has the use of the plans, models and data of the Compagnie Internationale d'Electricité. The works will employ about 1,200 men. The buildings are up and the machinery will be ready for operation in about three months. In January this Moscow company contracted to install a lighting, railway and elevator plant at Tsaritsyne, Russia, amounting to $500,000, and according to last report it had orders on hand to start with footing up to $400,000 more.

Italy offers many opportunities for electrical enterprise because of its mountain streams, suitable for generation of current for long-distance transmission and application to railway and other purposes. There is already some home manufacturing of electric apparatus to meet the demand, and a new company affiliated with General Electric interests is about to erect another plant for the purpose. The Italian duties are sufficiently high to make electrical manufacturing in the country pay in competition with the outside makers, and in securing orders there is also an advantage in being on the soil with the apparatus ready at hand. The nature of the market prevents the undertaking of any high degree of specialization in electrical machinery manufacture.

CHICAGO MACHINERY MARKET.

A machine tool salesman, just returned from a trip through the country, said that when he remarked to his customers that business was falling off somewhat, they expressed astonishment. Their own trade was so good that they failed to grasp the

reality of different conditions elsewhere. It is pretty well assured from this and many other evidences that activity among Western manufacturers will continue for months to come in the absence of the unexpected. Orders are booked which will require that time to fill. That is the unyielding basis upon which trade now seems to rest. And in harmony therewith, the machine tool trade continues active. Perhaps fairly active may express it better.

Three new automobile manufacturers are asking for machinery at Chicago. They all purpose the manufacture of vehicles propelled by gasoline power. There is a moderate number of other new plants fitting out for early operations. The Pratt & Whitney Company has sold an equipment of twenty-seven tools, aggregating about $8,000 in value, to the prospective manufacturer of a specialty in this city. The railroads are buying more freely. The Santa Fe has been in the market, and the Burlington and others are asking for an increasing number of new machine tools. Requisitions from the various shops in full activity are supplementing a trade that, in the light of all circumstances, must be regarded as satisfactory. It is not so insistent as a year ago, and the volume will, perhaps, not make favorable comparison with that period; but, making allowance for the unusual character of the buying in the summer of 1899, the present trade is large. Buyers want their purchases at once, and make vigorous protests unless quick shipments follow an order. From factory there is improvement in the delivery of small tools, but on planers and many of the larger tools continued delays occur. Not many buyers are on the street, but the mail business is larger. Some sellers report trade quiet; others say it is entirely satisfactory. J. B. Doan & Co. say that April proved to be the best month since early in 1899, and that May starts off with the promise of equaling April. Those who call trade quiet say it is in comparison with last year.

Wood-working machinery is unfavorably influenced by the strikes in the building trades. The consumption of lumber has decreased to a marked extent, carrying the lull into all the related industries. Iron-working machinery suffers from that source not at all, so far as can be observed. There is a disquieting sympathetic effect from the drop in the prices of various iron and steel products, but it is lost in the opposing current of orders. The machinists have all returned to work, with very few exceptions, and the strike has passed into history.

The Atlas Engine Company has sold to the Alton Railway, Gas and Illuminating Company, of Alton, Ill., a special 750 horse-power engine, direct coupled to generator; also a 200 horse-power engine to a concern in Los Angeles, Cal.

CINCINNATI NOTES.

United States Consul to England Marshall Halstead, son of the distinguished author and newspaper man, Murat Halstead, is at home from England on a visit, and some things he says concerning American manufacturers abroad are extremely interesting:

"Concerning the gabble that some papers indulge in with reference to the fact that American manufacturers sell abroad at lower prices than they do at home, it is worth while to state that all countries sell for export at a lower price than they do in the home markets.

"Thus Americans buy cheaper abroad than those living in the country in question. If our manufacturers would only push in vigorously now," said Mr. Halstead, emphatically, "they would smother competition till they had established a trade-mark, then they could not be driven out."

A number of men have been laid off in several of the machine tool concerns, because they are full up on stock.

Quotations.

NEW YORK, Monday, May 14, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:	
No. 1 X foundry	$21 50 @ $22 00
No. 2 X foundry	20 50 @ 22 00
No. 2 plain	18 75 @ 19 50
labama Irons:	
No. 1 foundry	22 25 @ 22 75
No. 2 foundry	21 25 @ 21 75
No. 3 foundry	20 25 @ 20 75
No. 1 soft	22 25 @ 22 75
No. 2 soft	21 25 @ 21 75
Foundry forge	19 50 @ 20 00

Bar Iron—Base sizes—Mill prices on dock are 2 @ 2.10c. for good refined brands, with inferior ones probably obtainable for less. Store prices are .30 @ .40c. higher.

Tool Steel—Base sizes—Standard quality, 6½ @ 8c.; extra grades, 12 @ 14c.; special grades, 16c. and upward.

Machinery Steel—Base sizes—prices are irregular, a sale of about a ton from store having been made at 2.45c., although quotations range as high as 2.85c.

Cold Rolled Steel Shafting—Base sizes—From store, 3¾ @ 4c.

Copper—In carloads—Lake Superior ingot, 16⅞ @ 17c.; electrolytic, 16¾ @ 16¾c.; casting, 16¾c.

Pig Tin—In 5 and 10-ton lots, 28¾c., f. o. b., New York.

Pig Lead—The market, having fallen 30 points more, is now 4c. in wholesale lots, carloads being quotable .02½ @ .05c. extra.

Spelter—Prime Western, 4.60c., New York delivery.

Antimony — Cookson's, 10¾ @ 11c.; Hallett's, 9⅝c.; United States, 9½c.

Lard Oil—Prime City, 62c. in barrel lots.

The Paris Exposition—II.

EDITORIAL CORRESPONDENCE.

It is being constantly more and more forcibly shown (too late for the present exhibition, however), that it is the part of wisdom to do all possible work at home and have it ready for use on arrival here. Those Americans who are having experience with French workmen and with French workshops will be sure to remember this should they take part in another foreign exhibition; but the trouble will be, I suppose, that at that time most of the men now gaining their experience here will remain at home and new men will be sent out.

Those, especially, who have occasion to procure pipes and fittings for conveying water or steam are having quite an interesting experience, and incidentally learning something of the intricacies of French pipe fitting. They use here wrought, welded fittings. These are made in certain sizes, and if one happens to want a size not kept in stock he had better make up his mind to cease wanting it. Up to about 3-inch pipe Crane threads are obtainable in fittings, but experience shows that even when work is ordered from a prominent house and a drawing supplied, showing just the dimensions—distances center to center of elbows, etc.—the variations will amount to as much as an inch or so in many cases, and where large piping has been ordered and the thing specified did not happen to be on hand, something else somewhere near it was calmly sent, and when the buyer, not so calmly, perhaps, calls attention to this, he is informed that is the nearest they have to his requirements, and if it don't suit him he can look elsewhere. Mr. Drake informs me that in fitting up steam pipes he has used in some cases T's having American, English and French threads all in one piece.

SPECIAL PAYMENTS.

Bills, too, are exorbitant, added to which there must be certain payments of *pourboir,* if one's work is to be pushed ahead. One young man who had heard that one must distribute francs liberally among workmen in order to have work go ahead, determined that he would not do it, but concluded after a little experience that he would. He says that when you are having work done you must "be franc with them;" that is to say, you must have your pocket well filled with francs, must be liberal with these francs, must announce your intention of staying right there until your work is done, and must, moreover, stay.

Francs have constituted the roller bearings, so to speak, upon which many things have made progress that would otherwise not have been possible. They have caused machinery to be loaded on the cars at Havre within three hours of their application, which machinery seemed, previous to that time, to be destined to remain on the wharf until the exposition ended. They

have caused an individual wearing a uniform indicating the possession of authority, to break the seal on a carload of machinery, to quickly and radically change his mind as to his ability to break it at once, and to rush for the car at such a rate as to make it difficult for the man who had been "franc with him" to keep up.

ONE WAY OF FORCING THINGS.

That there is an alternative method of dealing with these people is, however, shown by the experience of a member of the Swedish commission, who was responsible for the installation of the iron and steel exhibits of his country. He is an engineer and accustomed to seeing things go ahead and to having something to do with their going. After satisfying himself that nothing would be delivered until he took some vigorous action, he went to the office at the terminal freight station, presented his papers and, refusing to take no for an answer, insisted that a man should be detailed to go with him to hunt up a certain car. When this car was found he compelled the man to at once get an engine, cut the car out and set it in where it could be unloaded. His compelling power took the form of threats to take the man by the collar unless he "hustled" and did something. He never let him out of his sight nor beyond arm's length until the car was where he wanted it and a team was secured to take the cases to the Champs de Mars. With his 6 feet of stature and 250 pounds of weight he terrorized this French freight office so that afterwards when he appeared they, exclaiming "the great blonde from the North," asked him his pleasure and did his bidding. The Swedish iron and steel exhibits were among the very few that were ready on the opening day, although in some cases as much as 400 francs, or $80, was paid for moving one four-horse truck load from the Northern station to the Champ de Mars. This, I am informed, has been paid under protest, and will be made a subject of diplomatic inquiry later if not otherwise satisfactorily adjusted.

HIGH PRICES.

Prices are, however, on a high scale here in Paris, even in ordinary times, and are, of course, higher now. Food supplies must be drawn in from a wider area to meet the increased demands, and as no article of food, nor anything else, can come within the fortifications without paying the *octroi* duties, everything is, of course, artificially enhanced in cost. I saw the other day in front of a store a roll-top desk. It was labeled "Bureau Americaine, 239F.," or $49. If one of as poor quality could be found in New York it would sell there for about $12.

I called the other day at the Paris shops of M. Huré, the inventor and builder of the peculiar milling machine with a spindle which can be set at any angle (illustrated in our issue of July 9, 1896). He builds his larger work outside the city, and pays *octroi* on every bit of material and supplies brought into his Paris shops, besides having to pay higher wages to his men, whose living expenses are augmented by the same condition.

He is evidently building and selling a good many of these milling machines, though I saw no evidence of the possession of jigs or special fixtures, such as would be considered necessary for the work with us, and all the work seemed to be going on at a pace that would be ruinous in America. Mr. Huré has ideas, however, and his shop is very neat and cleanly.

A MILLING AND BORING MACHINE.

M. Huré has applied the principle of his milling machine head to a combined boring and milling machine, one of which is shown in his exhibit at the Champ de Mars, and of which he has kindly given me a blueprint, no photograph being at this time available.

The drawing shows the spindle vertical and (at the lower right-hand corner) horizontal, with arm support. Milling can be done at any angle, and at first I thought that boring or drilling could be as well, but this does not seem to be so, because for that there must be a feed motion in line with the spindle, whereas the only feed motions available are the horizontal and vertical ones.

It will be practically impossible to pursue any orderly system in the presentation of machines shown here, but I shall have to simply take such machines as it is possible to get material for, and in such order as the material can be gathered.

COINING PRESSES.

The Ferracute Machine Company usually coins some trifling thing in the way of a souvenir at exhibitions and sells them at a price sufficient to cover the cost of the metal used. They were prepared to do that here, but are not allowed to do so, because a French exhibitor has been granted a monopoly of such sales. This exhibitor is not, I believe, a maker of coining presses, and shows only a hand-power screw press, such as the late George Escol Sellers described in our columns as having been used at the Philadelphia mint many years ago. But whatever may be said for this press, it must be conceded that the medals displayed in the circular showcases that surround it are exceptionally fine specimens of such work, and I am sure I have never seen such beautiful coining before. Both in design and execution it seems the hight of perfection. Near the entrance to the main building, east of the Eiffel tower, is a power toggle-joint coining press by a French builder, which, as an example of architectural design is a wonder. I take it that the mechanical features of the press have been borrowed, while the architectural or monumental features are probably original and have been designed by an artist in a style which no American designer ever approached in the days when we were building machinery in the architectural style.

CONCESSIONAIRES.

A prominent official of the American section tells me that a great deal of space is to be used by *concessionaires* in various money-making schemes that really ought to have been allotted to exhibitors and used for exhibition purposes. Not only is the French space being so used, but a considerable portion of that allotted to other nations as well.

Along the south bank of the river, east of the Eiffel tower, is a very long row of buildings erected by the various nations as their headquarters. This official told me that our building is absolutely the only one of the lot which is devoted entirely to the purposes for which such a building is supposed to be erected—that every one of the others is more or less devoted to the sale of something or other, and given over to trade. Some of us are wondering a little whether this circumstance may have any effect in modifying the generally held opinion in Europe that Americans know nothing nor care for nothing but the almighty dollar.

THE CRANE AT VINCENNES.

The very great usefulness of an overhead traveling crane, of course, needs no proof in these days, except among the uncommonly benighted, but the difference between having one and getting along without has been vividly shown during the past week at the Vincennes annex, where, since power has been available, the crane has been used in installing machinery. A line of cars standing upon the track running through the center of the steel-framed bay is unloaded in any order that seems most advantageous, the machines or boxes being carried over the other still unloaded cars whenever necessary, and when the cars are to be moved the hoisting chain is attached to them and the crane draws them along upon the track as readily as a locomotive would do it, though there is, of course, a good deal of slack to be taken up when stopping, and the "automatic brake" is in the usual French form of a wooden lever attached to the side of the "dinkey" little car, which lever is borne down upon by the brakeman at one end, the other coming into contact with one of the wheels.

THE PROGRESSIVE GERMANS.

As was the case three years ago when I was over here, so now it is being shown in various ways that among the European nations the Germans are most progressive industrially and most ready to take up with new ideas. An instance that is strongly illustrative of this fact was related by the representative of a prominent tool building establishment which about a year ago brought out a new automatic machine tool, and found that all they could make of them were steadily called for by their German customers, other European peoples taking scarcely any of them. Within a short time about 200 of

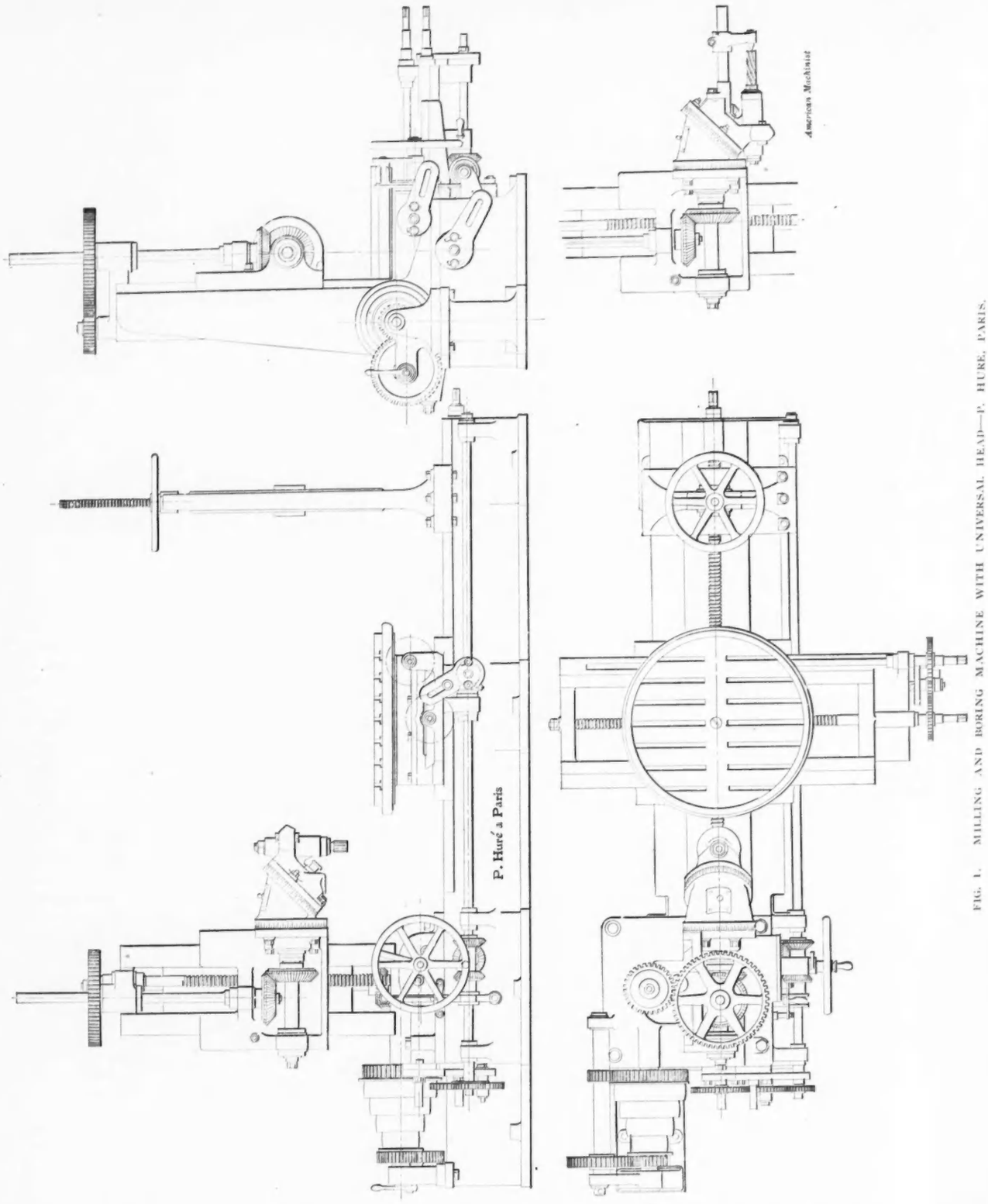


FIG. 1. MILLING AND BORING MACHINE WITH UNIVERSAL HEAD—P. HURE, PARIS.

these machines had been put at work in the Black Forest region of Germany alone. France had taken a few, but Great Britain none. The attitude of the three countries seems to be fairly characterized by saying that the Germans eagerly seek for new things that seem meritorious, the French are indifferent to them, while the Britons repel them.

Of course, it is to be understood that this is intended to apply only in a broad sense, for, of course, there are exceptions in all three countries. In fact, one of the interesting features of the British tool trade is the way in which our heavy tools are going over there. Next to the largest single installation of heavy Niles tools anywhere in the world is in Sheffield, England, and American planers up to very large sizes are especially well liked in England, and sell readily in shops where they are once introduced at prices considerably higher than those of home make. The larger sizes of American boring and turning mills do not, I am told, sell so readily in Great Britain, simply because the home article is generally an excellent and satisfactory tool.

An American who has given much time to the study of the British tool trade and has had exceptional opportunities for doing so throughout a series of years, tells me he is surprised that the advantages to

an American manufacturer of having his own storeroom and place of business in London are not more generally perceived. He thinks that houses located thus and employing travelers who are Americans, with shop experience, could introduce American tools much faster than is otherwise possible. I give his opinion for what it is worth, and, of course, without attempting to decide the question as to whether in most cases the very large expense entailed would be justified. A familiar compromise between this and the other extreme is to consign or sell to a London dealer, but to send over one's own salesman to interview and advise with customers.

An example of what may be done to make things pleasant for visitors to such an exhibition as this was afforded by the Paris firm of E. Krauss & Co., opticians and makers of instruments of precision. They invited all those whom they could find in Paris interested in their line of work to their factory, 21 Rue Albony, the evening of the 21st inst., where they had cleared their salesroom and provided it with a small stage, on which a vocal and instrumental concert was given, after which there were a supper and a dance. The cosmopolitan character of the gathering is indicated by the statement made to me that people speaking fifteen different languages were present, and, as was intended by the hosts, there was a good opportunity for forming pleasant acquaintances from all parts of the world.

Paris, April 27. F. J. M.

The Genesis of the Magazine Shoulder Gun.

BY E. G. PARKHURST.

Three hundred and fourteen years ago and during the "good old days" still proverbial in England of the reign of that extraordinary woman, Queen Bess, who at that time was considered by some of her subjects little short of a goddess, there lived an artist gun maker, not only an artist but an inventor, who invented and made a ten-shot magazine shoulder gun, whose action was, and is, near perfection. John Cookson must have been an exceedingly skilled craftsman, and I am sure your readers will be greatly interested after closely examining the engravings of this most remarkable specimen of handicraft, which, to say nothing of its embodying an ideal invention, possesses symmetry in every line and curve from breech to muzzle, and the most captious critic can find no fault with any part or portion of its makeup. The old gun is a superb piece of mechanism—the most wonderful piece of workmanship I have ever seen and been allowed to handle. Could your readers see it they would agree with me that no mechanic lives at this day, having at his command all the modern appliances, who could produce anything which would surpass, either in design or execution this most beautiful specimen of antique gun work, which can be seen, perfect in all its parts, a monument to the genius of John Cookson, inventor and maker, whose remains have slumbered in silent dust these hundreds of years, though the principle on which his invention was based still lives and is now in active use by almost every nation on the face of the globe. May it not be, through some mystic influence to us unknown, that his spirit has at times imparted knowledge to other inventors? Could not some portion of his mantle have fallen on such men as J. P. Lee and others, who have, in these later days, so revolutionized magazine shoulder arms? Who can tell? *"Conquiescat in pace."*

HISTORY OF THE JOHN COOKSON GUN.

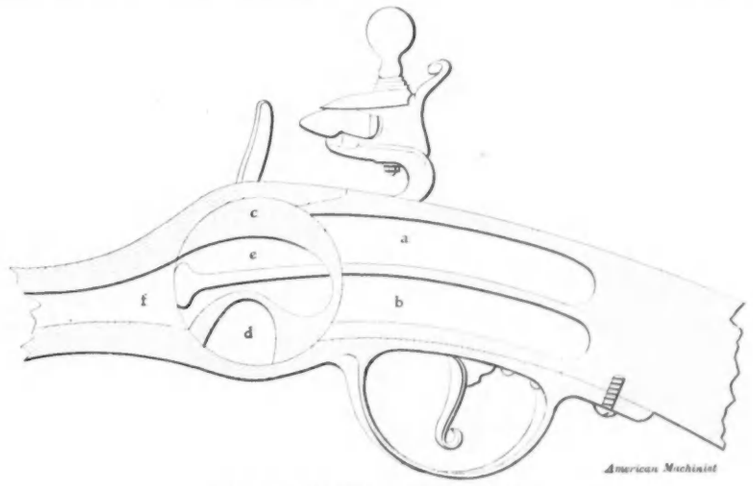
The history of the gun prior to 1863 is obscure. The name engraved upon it is evidently English, and indicates that it was made by John Cookson, an Englishman, in the year 1586. It was during this period, the later part of the sixteenth century, when Spain was in the zenith of her power. She was far in advance of other nations in the arts of metal working, particularly that of firearms. Therefore it is more than supposable that Cookson may have been educated in Spain, especially as the general design and character of the work point toward the theory of his having entertained Spanish ideas. There is also a visible trace of Moorish design in the engraving of the small work, which in a measure confirms this view of the subject.

The gun found its way to Maryland, probably with the early English colonists, and was finally discovered in Baltimore. It was one of a number of guns confiscated after a search for arms by the provost-marshal in 1863, and by him retained in the custody of the United States until after the close of the rebellion. It remained unclaimed until 1867, and was finally thrown in the scrap heap, where it was picked up by a scavenger, who sold it for a nominal sum.

Mr. A. E. Brooks, of Hartford, Conn., purchased the gun September 24, 1891, of Richard Heinze, a gunsmith of Baltimore, who gave all the information he could regarding the ancient weapon. In the fall of 1888 the gun was brought to his shop by a man who asked to have it repaired and changed to a percussion lock. Mr. Heinze examined it, saw that it was extremely rusty, and considered it of little or no value. The alteration of the lock was out of the question. He finally bought the gun for a trifling amount and put it away with a number of others. Some two months later he made a closer examination of the gun, and became greatly interested in his "find." He at once began removing the rust, and labored faithfully at its restoration for eleven days, until he had put it in its present perfect condition. The old arm has been loaded and fired several times, and a good score made.

DESCRIPTION OF THE GUN.

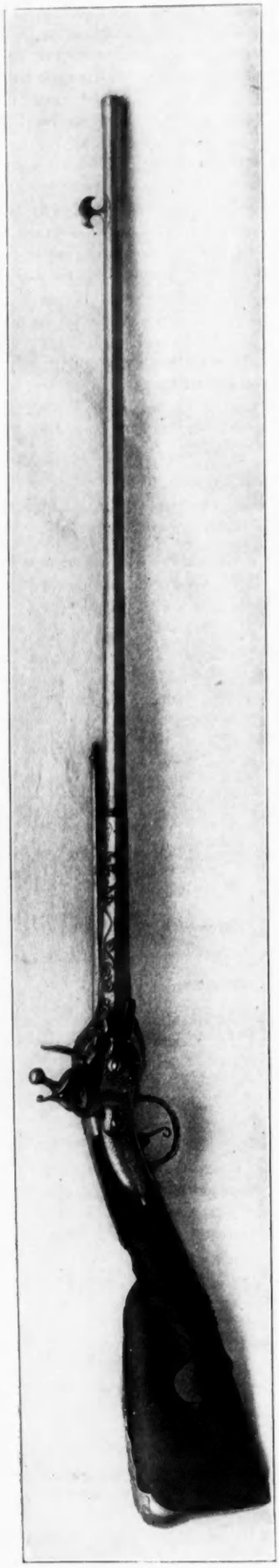
It is difficult to tell whether the barrel is twist or laminated. The butt-plate is both embossed and engraved. The front sight is a Turkish crescent. All the metal work is more or less engraved, showing flags, drums, piles of cannon balls, cannon being fired, stacks of muskets and boarding pikes, etc. On the top of the barrel appears, "John Cookson, *fecit*" (made by John Cookson). On the lock is a scroll bearing the maker's name; it is held up at the left by an angel, at the right by a female figure, presumably intended to represent Queen Elizabeth. The stock is made of a peculiar kind of wood, unknown to this country. All the trimmings are of iron.



SECTION OF THE COOKSON GUN.

The letters in the following description refer to the sectional view.

The arm is a magazine smooth-bore flint-lock gun, firing spherical bullets, weighing 260 grains, and a charge of about 125 grains of powder. It has a capacity of ten rounds, and a magazine is also fitted to the lock for a similar number of priming charges. It is charged on the left side through an opening with a hinged flap, shown open in one of the half-



THE COOKSON BREECH-LOADING MAGAZINE GUN, MADE IN 1586.

TOP VIEW OF BREECH MECHANISM.

RIGHT SIDE OF GUN.

LEFT SIDE OF GUN, SHOWING MAGAZINE PARTLY OPEN.

tones, the bullets being poured into one compartment *a* and the powder in another adjacent one *b*. These compartments connect by cylindrical passages with the central chamber in the frame, in which is located a solid cylindrical block *c*, with its axis from right to left. This cylinder forms the recoil block, and is fitted with two radial cavities large enough to hold a ball and a charge, and located so that, in revolving, the cavities will be opposite the passages from the magazine. Here the ball drops into the first cavity *d*, and the powder into the second *e*, and by revolving the cylinder to the front the passages are closed and the ball and charge brought in front of the rear end of the bore *f*, the loading being done with the muzzle held down. The bullet then drops in and the block remains with the charge in line with the bore. The powder cavity is fitted with a diaphragm to prevent the bullet from dropping into it.

The powder cavity or chamber is connected by a vent, through the axis of the cylinder, with the pan. The pan is a cavity in one end of the cylinder or breech-block on the right side, and revolves in the lock in front of the magazine containing the priming charge, where at each revolution it scoops up a charge and revolves it in place under the flint and closes the opening to the magazine.

The cylindrical breech-block is revolved by a lever on the left side, which also cocks the hammer and closes the pan. This automatic action is accomplished by a stop on the cylinder acting on a hooked lever arm attached to and pivoted on the hammer. The stop pushes the hammer back by the lever, and the hook on the latter pulls the steel pan-cover into place. The lock and trigger are the ordinary design, but it is worthy of note that the design as regards sear, sear-spring, mainspring, etc., is the same as that used on the latest flint-lock guns. The barrel, front sight and under side of the guard are all in one piece, and the carving and other work show evidence of the highest mechanical skill.

The only omissions in the provision for all the necessary points in the design, from a mechanical point of view, are those for inserting a wad, and preventing the escape of gas through the vent. The former is partly compensated by making the bullet slightly larger than the bore, and the latter exists in all flint-locks. From a military point of view, the design of the arm gives evidence of being far in advance of its time. With the magazine charged, the ten shots could be fired in a time which would compare very favorably with magazine guns of to-day. Very little time is required for charging, as it is only necessary to fill the compartments with bullets and powder, with no counting and measuring. The charges are automatically measured, and the loading is fully as accurate as that of metallic cartridges.

Again referring to handicraft, it is a mystery to us how and with what the craftsman produced the bore of his gun barrel. As it is a continuation of receiver and tang for same, many difficult problems must have been encountered in the way of construction, and to complete the arm with such limited contrivances as Cookson could only have had in his day must have consumed unlimited time and a vast amount of patience, particularly in the embossing and engraving, as nearly every part has some distinctive figure or emblem cut upon it.

WHERE THE GUN NOW IS.

The arm belongs with the A. E. Brooks collection, which can be found at the Atheneum in Hartford, Conn., where at the present time it is deposited for safe keeping. Mr. Brooks has one of the most complete, perhaps I should say wonderful, collections of curios ever gotten together, which in many respects cannot be equaled. We are told it is now for sale, and I will add it would be a public disgrace should the citizens of Hartford ever allow the said collection to be taken away from their city.

In conclusion would say: Oh, that some power were given us whereby the veil of mystery could be raised which enveloped for two hundred and seventy years the hiding place of this exceedingly valuable relic of "ye olden time," which by mere chance was resurrected and now stands as a silent witness to corroborate the oft-used maxim, "Facts are Stranger than Fiction."

Hartford, Conn.

A New Mechanical Movement.

BY C. R. GABRIEL.

The following article, together with the several cuts, describes a new mechanical movement. The movement is especially useful in mechanism in which a rotary gear is to be driven for a part of a revolution at a constant speed and started and stopped with a "harmonic motion," which eliminates jar or shock.

In its simplest form the movement comprises a driven gear, a driver and abutments or rolls mounted upon the driver, arranged diametrically opposite each other with their centers on the pitch circle of the gear, and engaging the opposite sides of a cam tooth connected with the driven gear; several teeth being removed from the driven gear beneath the cam tooth.

With this construction, one of the rolls acts against one flank of the cam tooth to start the driven gear from a state of rest, and gradually increase its speed until the driven gear has at its pitch line the linear velocity of the driving gear, when the gear teeth are brought into action and drive the driven gear until one of the rolls engages the opposite flank of the cam tooth and acts to gradually bring the driven gear to a state of rest. It will be noted that during the starting and stopping the cam tooth is held under control at every point until the gear teeth engage, making it impossible for the driven gear to get out of time with the driver, also it is securely locked when the rolls are between the diagonal lines shown on the cam tooth. When in the position last named, the driven gear requires no "locking arc," as used in other forms of "intermittent motions" where the driven member has a period of dwell during a greater or less angular movement of the driving member.

Another novel feature of this movement is that the driven member does not necessarily intermit at every revolution of the driving member, as the ratio between the driver and driven may be anything the designer desires. Also the shape of the cam tooth may be varied to give the desired starting and stopping motions, and to vary within certain limits the time during which the driven gear is stationary, when the driving gear constantly rotates; or more than one cam tooth may be connected with the driven gear, so that it will be brought to rest before it has made a complete revolution.

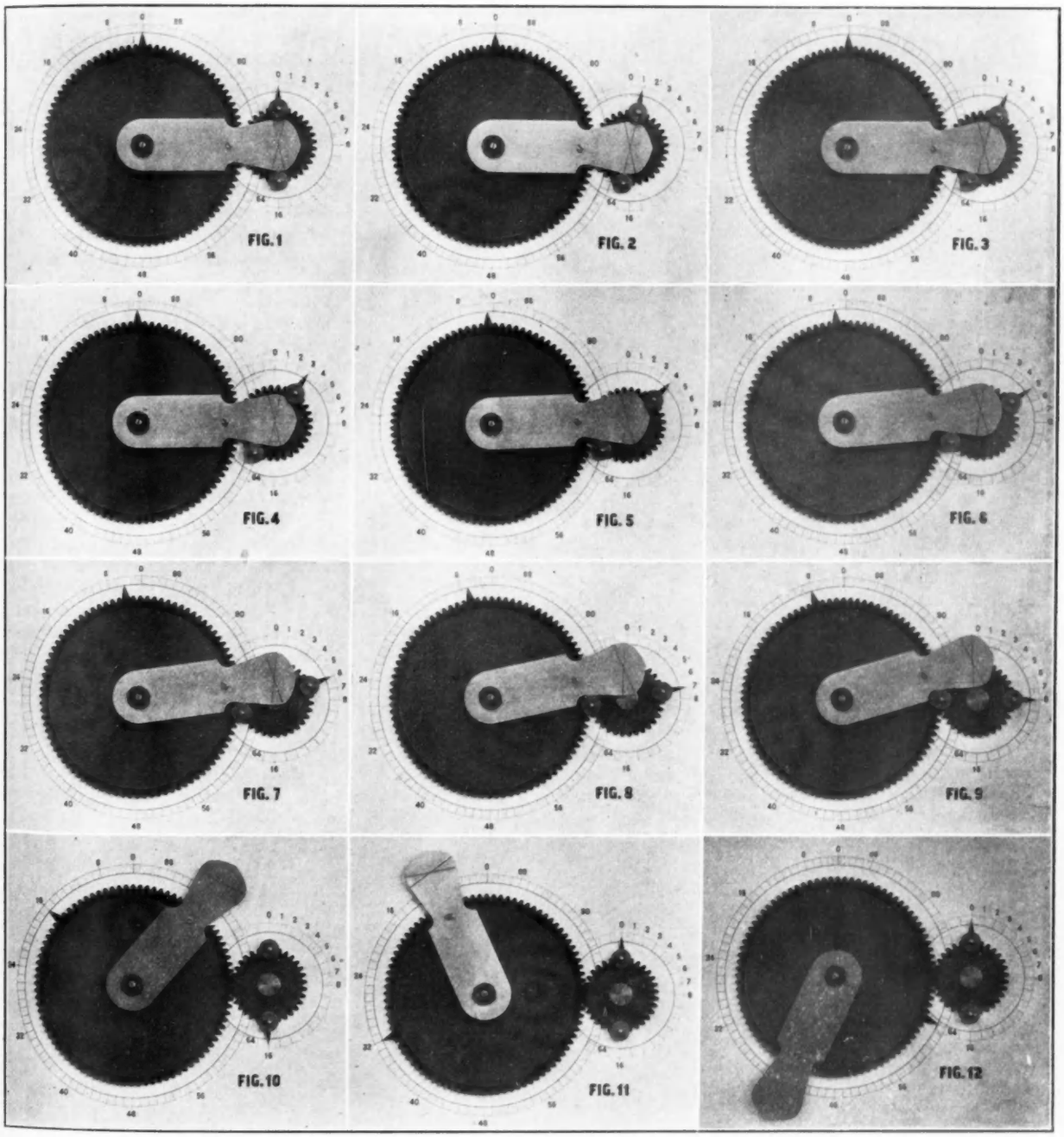
In the mechanism as shown, the sizes of the gears and the number of teeth in each, are so related, and the shape of the cam tooth is so proportioned, that the driving gear revolves three revolutions to one of the driven gear. It will be understood, however, that this particular ratio and construction is selected merely for the purpose of illustration. To assist in the explanation, graduated dials have been placed back of the gears, with index pointers to show the relative positions of both during a complete revolution of the driven gear. The dial back of the driving gear has thirty-two equal divisions, the driven-gear dial has eighty equal divisions, between 8 and 88. The spaces between zero and 8 and 88 and zero are a series of increasing and decreasing graduations, generated by the action of the rolls on the cam tooth, equal in the aggregate to eight of the equal divisions. The driving gear in rotating from zero to 1, imparts no movement to the driven gear, due to the dwell on the cam tooth indicated by the diagonal lines. The driver in rotating from 1 to 8 on its dial, drives the driven gear from zero to 8 (see Figs. 1 to 9, inclusive). In Fig. 10 the pointer indicates that the driving gear has rotated one-half a revolution and the driven gear has advanced to 16 on its dial. Thus, it will be observed, during the first quarter turn of the driver, the driven gear advances one-half the linear distance that it does during the second quarter turn of the driver, at which time the linear velocity of both gears is equal. The same condition occurs after the driver has completed two and three-quarter turns. During the last quarter turn of the third revolution, the driven gear will advance from 88 to zero, which space is equal to that between zero and 8. Therefore the ratio between the gear teeth must be such as will compensate for the

tooth spaces consumed on the driver, while the rolls and cam tooth act to accelerate and retard the driven gear. This ratio is found to be 2¾ to 1, in order to bring the cam tooth to the position shown in Fig. 1 at the completion of the third revolution of the driving gear.

To explain better how this ratio is obtained, we will speak of the gears as having advanced a given number of circular pitches. The driving gear in this case has thirty-two teeth; in rotating the first quarter turn it will advance eight circular pitches. The cam tooth is so designed that the driven gear will advance four circular pitches during the same time. As the same conditions exist during the last quarter turn of the third revolution of the driver, it is plain that the driver will advance sixteen circular pitches to move the driven gear eight circular pitches, while accelerating and retarding the speed of same.

We will now consider the number of teeth necessary for a driven gear to contain in a case of spur gears where the driver has thirty-two teeth and the ratio 3 to 1 is desired. This is found to be 96. Our previous reasoning showed that in the case in hand the driver advanced sixteen circular pitches, or double the linear distance traveled by the driven gear while starting and stopping. Therefore we have eight circular pitches of movement of the driver, which we must consider as lost, and compensate for the same by deducting eight teeth from the ninety-six, leaving eighty-eight for the number of teeth for the driven gear. This gives the ratio 2¾ to 1, as stated. In the case under consideration, six teeth have been removed from the driven gear beneath the cam tooth, leaving eighty-two. The two teeth adjoining the space have their form slightly changed to avoid interference with the driving gear while the cam is still in action, and serve to assist in holding the driven gear in control. Figs. 11 and 12 show the position of the driven gear at the completion of the first and second revolutions of the driver.

The efficiency of this movement may be



A NEW MECHANICAL MOVEMENT.

better demonstrated by describing a practical application of the same. At the present time it is being used as an indexing mechanism on the automatic gear-cutting machines built by the Brown & Sharpe Manufacturing Company, Providence, R. I. In this connection the driving gear is started by the engagement of a positive clutch, this clutch engaging after each return movement of the cutter slide, and is disengaged by means of a cam and abutment on the driven member of the clutch after the driven gear has made one or more revolutions as desired. The driven gear of the movement described is mounted on a shaft which carries the first of a series of change gears connected to the shaft which drives the index worm. The feature of great advantage in this application is that the train of gears and worm shaft are started and stopped without shock, thus relieving the shafts and keys from severe torsional strains and permitting the index worm to be brought to rest with a degree of precision not before attainable. Another feature of equal value in this connection is that the driven gear is at rest before the clutch teeth are disengaged. Thus correct indexing is assured and the necessity for stopping the driving gear accurately is a matter of secondary importance, as the driven gear is locked at any point between the diagonal lines on the cam tooth. This movement is the invention of the writer.

FIG. 1. FRONT VIEW OF UNIVERSAL GRINDER.

Electrically Driven, Hand Feed, Universal Cutter and Reamer Grinder.

The accompanying illustrations show a new departure in grinding machines and incidentally show also, in the clearest manner, the remarkable flexibility of electrical driving.

Referring to the front view, Fig. 1, and the transverse section, Fig. 3, the rear column on which the main emery wheel is carried, is elevated and depressed by the left-hand lower hand wheel in front of the machine. The emery wheel can also be adjusted to any position of the horizontal circle, graduations at the lower part of the rear column being provided for this purpose. Being also mounted in a swiveled fork, the wheel can likewise be adjusted to any position in the vertical circle, for which graduations are also provided. The fork which carries the wheel may also be adjusted forward or back in the top slide by the right-hand lower hand wheel. While in operation the wheel can be fed up or down, and in or out, over the entire surface of the table. By this combination of adjustments it is obviously possible to do a great variety of work without special attachments. For instance, in sharpening a formed milling cutter it is only necessary to elevate the column, run out the slide to the required hight, and proceed with the work as shown in Fig. 2.

The feed of the main table consists of a screw running the whole length of the table, working into a worm wheel in connection with a pilot hand wheel on the front of the machine, as shown in Fig. 2 and in the section Fig. 3. By revolving the pilot wheel the table is moved as by a rack and pinion. By clamping the pilot wheel through the pin shown in rear of the machine, the worm wheel becomes a nut, and the end hand wheel gives a microm-

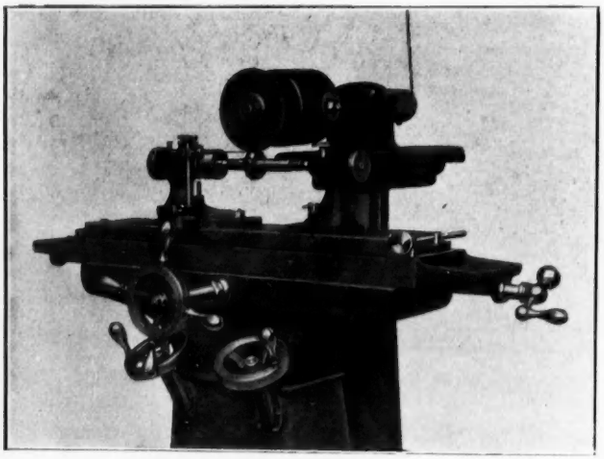


FIG. 2. SHARPENING A FORMED CUTTER.

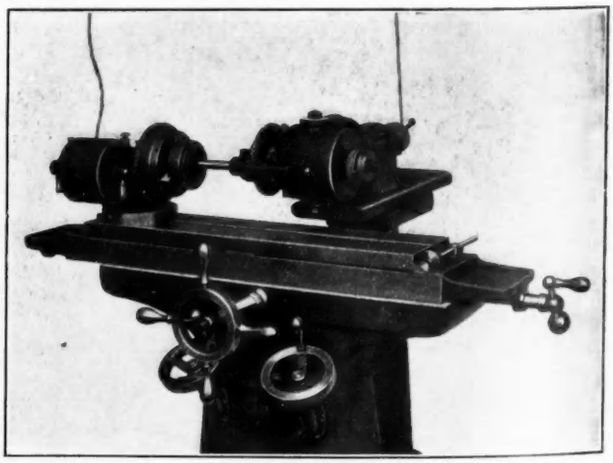


FIG. 4. INTERNAL GRINDING FIXTURE.

eter feed, which is needed in grinding the faces of a piece of work held in the chuck or otherwise.

For internal grinding the emery wheel spindle may be parallel with the main table, at right angles with it, vertical to it, or in any other required position. The internal grinding fixture is shown in Fig. 4. Many features of the construction are shown in the transverse section, Fig. 3.

Many of the adjustments are shown in the illustrations, which, as a whole, are self-explanatory and do not need detailed description. One point which will be noted in connection with Figs. 5 and 6 is the fact that either disk or cupped wheels may be used in grinding cutters, as may be preferred, and the same flexibility in grinding reamers is shown in Figs. 7 and 8, and in surface grinding in Figs. 9 and 10.

The circles are graduated in degrees, and all micrometer adjustments read to thousandths. The motor spindles run in ball bearings, as does also the internal grinding spindle. It is stated that no difficulty is experienced in continuously running this spindle at speeds of from fifteen to eighteen thousand revolutions per minute. The rear motor can be started, stopped, reversed, or have its speed

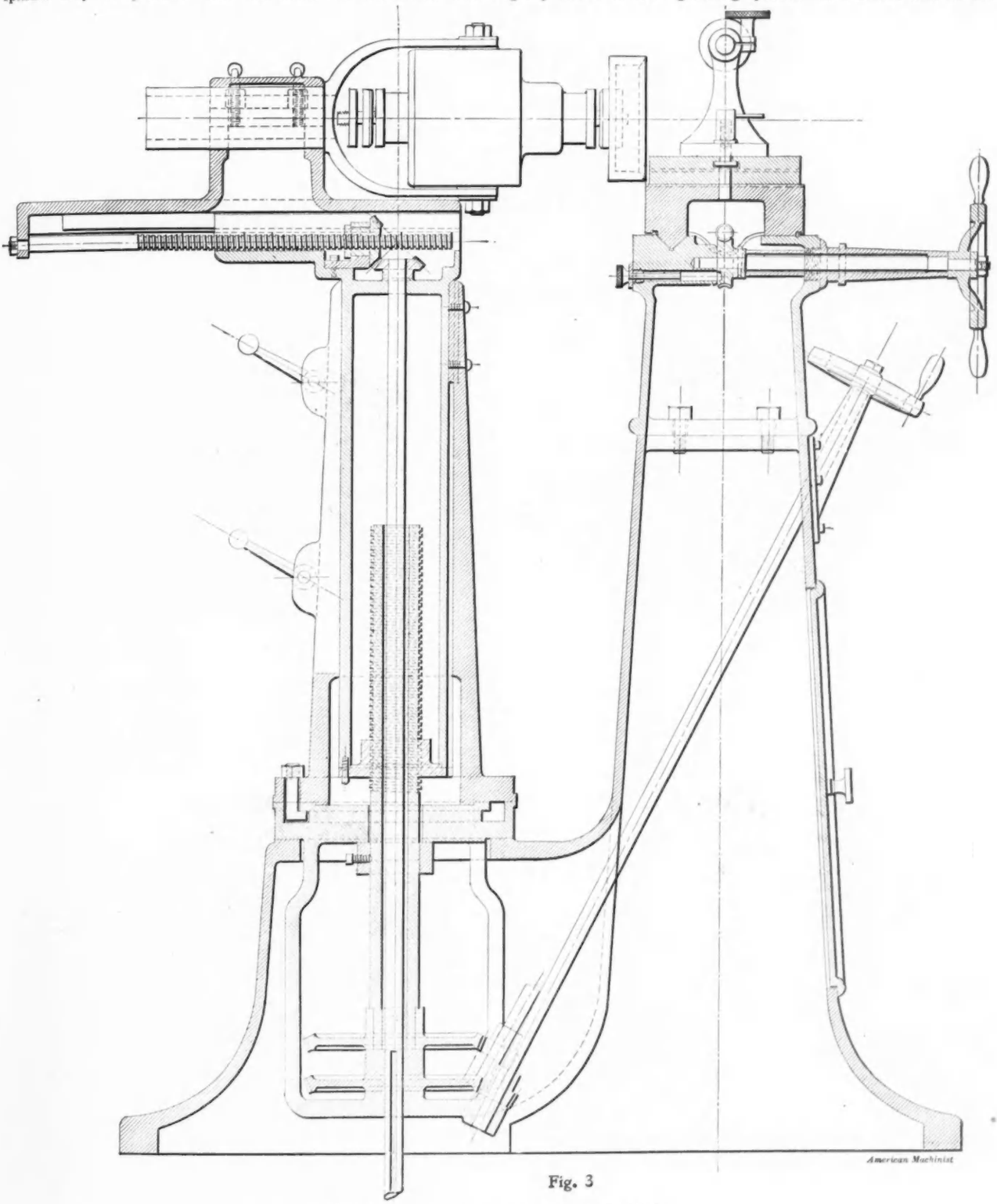


Fig. 3

TRANSVERSE SECTION OF UNIVERSAL GRINDER.

changed through a small handle at the rear of the fork, there being no external rheostats or resistance boxes.

The machine is of 9 inches swing and takes in 18 inches between centers. Its capacity in surface grinding is up to the entire size of the table top, which is 28x6 inches. It is the product of the Anderson Tool Company, of Anderson, Ind.

Legal Notes—Rust on Mold Furnished Employee—Braid Cutting Machine That Repeated.

BY W. MARSTON SEABURY.

Michael McCabe recently brought an action in the Superior Court of Suffolk County, Massachusetts, against Arthur E. Shields & Brother to recover damages for personal injuries sustained by McCabe while in Shields' employ.

The accident which caused the injury for which the action was brought occurred after the passage of St. 1894, C. 499, which provides that an employee injured by the negligence of one exercising superintendence, or in the absence of such superintendent of any person acting as superintendent with the authority of such employer, shall have the same right of compensation against the employer as if the employee had not been in the service of the employer.

The defendants were the owners of a small foundry, and when they were not present one Hannon, with their consent, acted as superintendent.

Hannon directed the plaintiff to use for a casting a mold in which he had made a perforation with a rusty piece of iron. There was evidence tending to show that the presence of the rust in the riser, or on the surface of the space in the mold around the riser, would be adequate to cause the accident if the molten iron came in contact with it; and further, that the quantity of rust which would adhere to the sand in the mold in perforating it with such an instrument as Hannon used would be sufficient in quantity, if brought in contact with the molten metal, to cause such an explosion as actually occurred, and which injured the plaintiff. Some experts also testified that the accident could be ascribed to no other cause.

The jury rendered a verdict for the plaintiff, and the defendants appealed.

The Appellate Court, without deciding whether the act of perforation was of itself one of superintendence, held that when Hannon placed the mold thus perforated in the hands of the plaintiff, and directed him to use it, he was acting as superintendent, and that the jury might properly find that it was negligent in him as such superintendent to place this dangerous mold in the hands of the plaintiff. (56 N. E. R., 699.)

One Packer recently obtained a judgment against the Thomson-Houston Electric Company for damages for personal injuries received by Packer. The plaintiff was employed to operate a machine known as a "Cranston & Jones undercut machine," for cutting braid, which when in proper order would make but one cut and then stop. On the morning of the accident the plaintiff was at work on the machine cutting elastic braid, a braid used in insulating wire. While the plaintiff was drawing the braid through, after having made a cut, there was evidence that the machine started from a dead stop, the clamp came down, and the knife arose and cut off both of his arms below the elbow.

There was evidence that on the morning

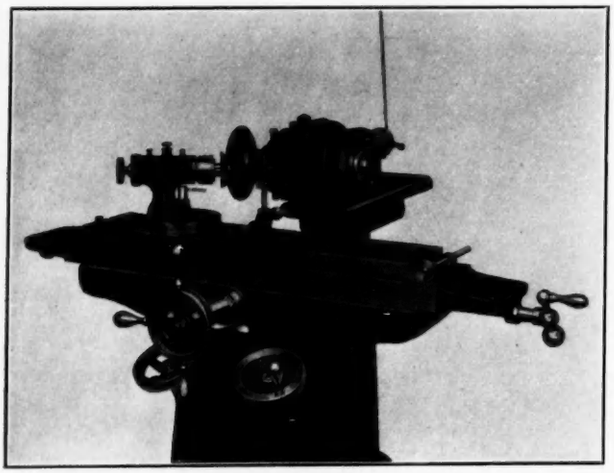


FIG. 5. GRINDING AN ANGLE CUTTER WITH DISK WHEEL.

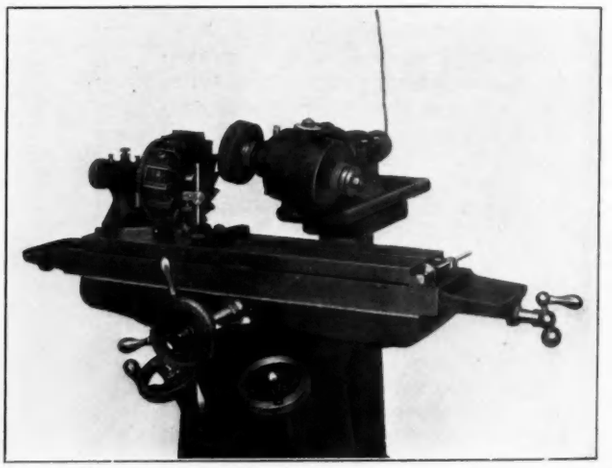


FIG. 6. GRINDING A FACE CUTTER WITH A CUP WHEEL.

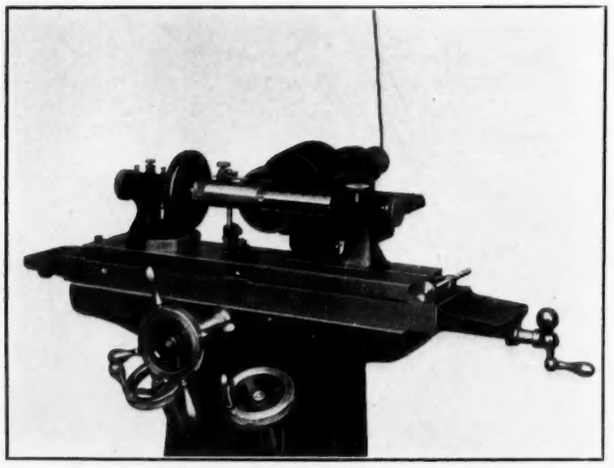


FIG. 7. GRINDING A REAMER WITH A CUP WHEEL.

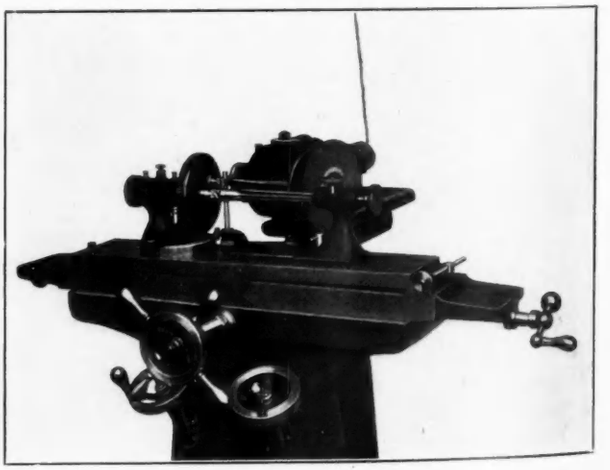


FIG. 8. GRINDING A TAPER REAMER WITH A DISK WHEEL.

of the accident the machine had repeated several times, and that the plaintiff knew of this fact. There was, however, evidence that the plaintiff did not know that the machine could start from a dead stop. In fact, the chief effort of the defense was to show by experts that, although the machine in the condition it was in immediately after the accident would repeat, it was impossible for it to start from a dead stop.

The plaintiff obtained a judgment in the trial court, and from it the defendant appealed.

The Appellate Court refused to disturb the judgment of the trial court, and held that although the defendant's witnesses testified that these defects would not cause the machine to start from a full stop, yet as there was evidence that the machine with these defects did so start, the instructions requested by the defendant could not properly be given, and the judgment should stand. (56 N. E. R., 704.)

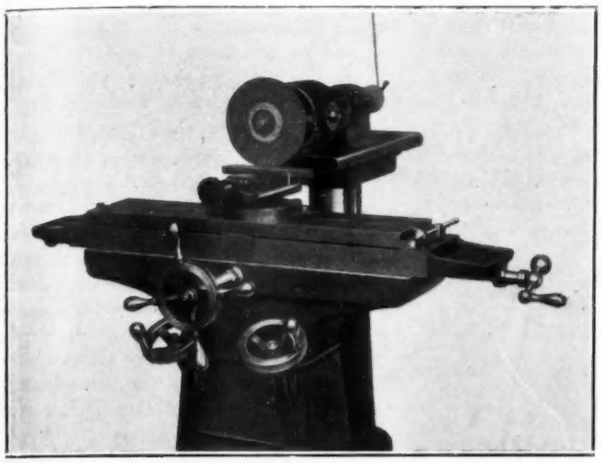


FIG. 9. SURFACE GRINDING WITH A DISK WHEEL.

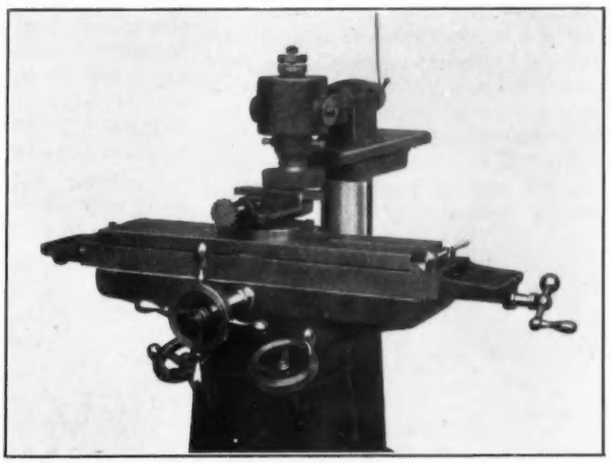


FIG. 10. SURFACE GRINDING WITH A CUP WHEEL.

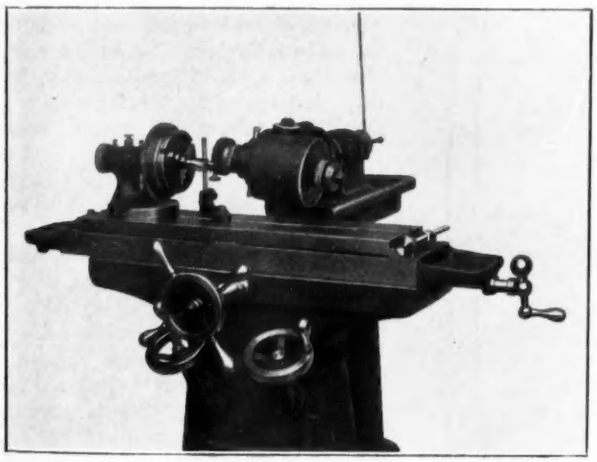


FIG. 11. GRINDING A COUNTERBORE.

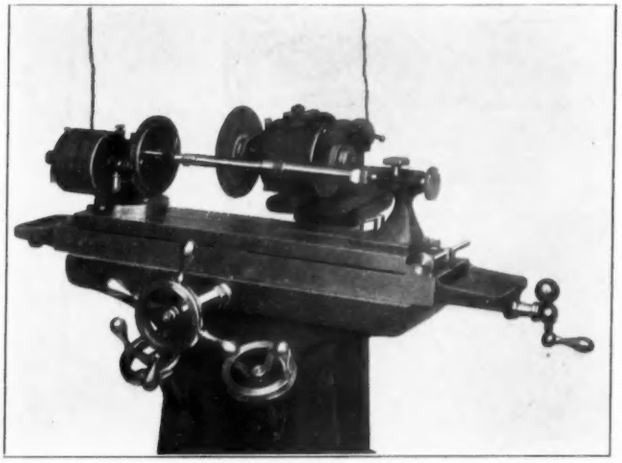


FIG. 12. CYLINDRICAL GRINDING.

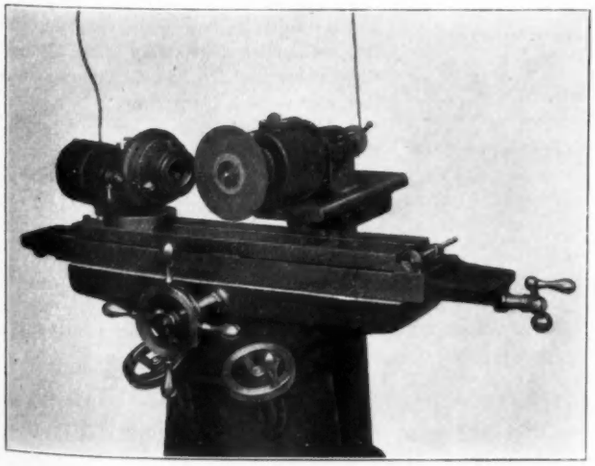


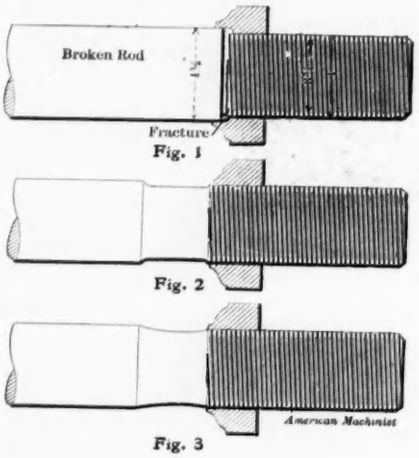
FIG. 13. FACE GRINDING A DIE.

FIG. 14. GRINDING A PLANER KNIFE.

Some Strange Breakages.

BY JOHN E. SWEET.

A compound Corliss engine of some 1,200 horse-power, used in a power station, had been subject to overdoses of water two or three times, and likely the piston rod had been so strained as to start an incipient crack just where such a thing always takes place—at the bottom of the last thread, where it screwed into the crosshead, and under the overlapping part of the nut, where it could not be detected. From the appearance of the broken ends, it was very plain that the original fracture did not extend in but a little way, and that the break had taken place in detail until at the time it let go the remaining metal was about one-tenth that of the original rod, showing that a factor of safety of about ten had been allowed. Fig. 1 shows the rod as made.



PISTON ROD CONSTRUCTION.

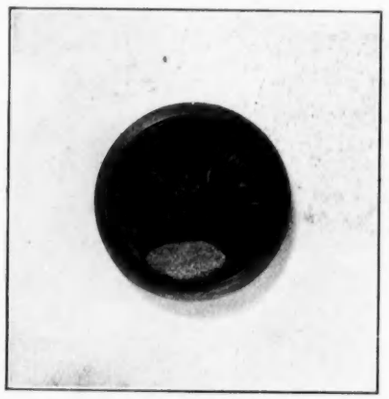
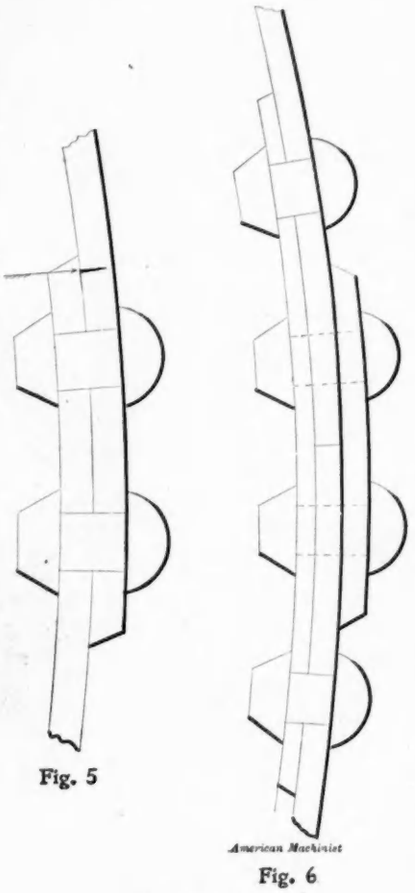


FIG. 4. FAILURE OF A CRANK SHAFT.

It is good designing to make a piston rod larger throughout the wearing surface than where it goes in the crosshead, so that it may be turned down as it wears and yet allow the packing and gland to pass over the thread. This making the end smaller than the body is bad for strength to begin with, and still worse when a thread is cut and ends near the shoulder. This concentrates every strain at that point; and to realize what that means, one only needs to cut a triangular nick around a bar of steel and observe how easily it will break compared to what it would stand if the bar was turned down to the same diameter for a few inches in length. This is exactly what should be done with a piston rod (see Fig. 2), and there is nothing to interfere for a length equal to the length of the gland, while it would probably cost less to turn it down than to leave it full size and box over the nut to disguise the thread, as was the case in this instance. Why engine builders do not do this, or why those who know enough are afraid to do it, is because they do not expect to be able to convince the purchaser that it is a good plan, and because they know their competitors will point it out as a very weak point, which to the ordinary customer would be apparently quite self-evident.



BOILER JOINTS.

Whether as shown in Fig. 2 or Fig. 3 is the best form depends on the character of the strains, and while it would be an interesting study to analyze the conditions where each would be the best, it is a good deal better to say that either is enough of an improvement to pay for the trouble of scooping out the stock and do it.

Another very remarkable case of this kind is shown by the photo Fig. 4. A Coffin-treated steel engine shaft, 5¾ inches in diameter was turned to 4⅞ inches where it entered the wheel, with a small fillet at the shoulder. After the engine had run about fifteen months it was reported that the shaft was loose, but as no particular harm came from it, it was allowed to run some months longer, until occasion occurred when it became desirable to change the engine. The engine was returned to the builders and the attempt made to force the shaft out. While far more pressure than seemed necessary to force out a loose shaft was applied, no impression was made. The shaft was then struck by a heavy hammer, when it fell to the floor. The area of the unfractured section where the final parting took place was not over 1½ square inches, as against about 18⅝ square inches of the original size. Just how the small section accomplished the work that the original piece, which was more than ten times the size and over one hundred times the strength, failed to do, is one of the difficult things to understand.

These examples are interesting and ought to be instructive.

Several recent boiler explosions have been caused by a similar sort of trouble. Fig. 5 shows where the sheet cracks, and the cause is likely due to the fact that the sheets get a lot of hammering to bring them to shape where bending rolls do not complete the curve, and secondly, because the joint in the boiler is more rigid and the changing of form by change in pressure or temperature concentrates the bending at that point.

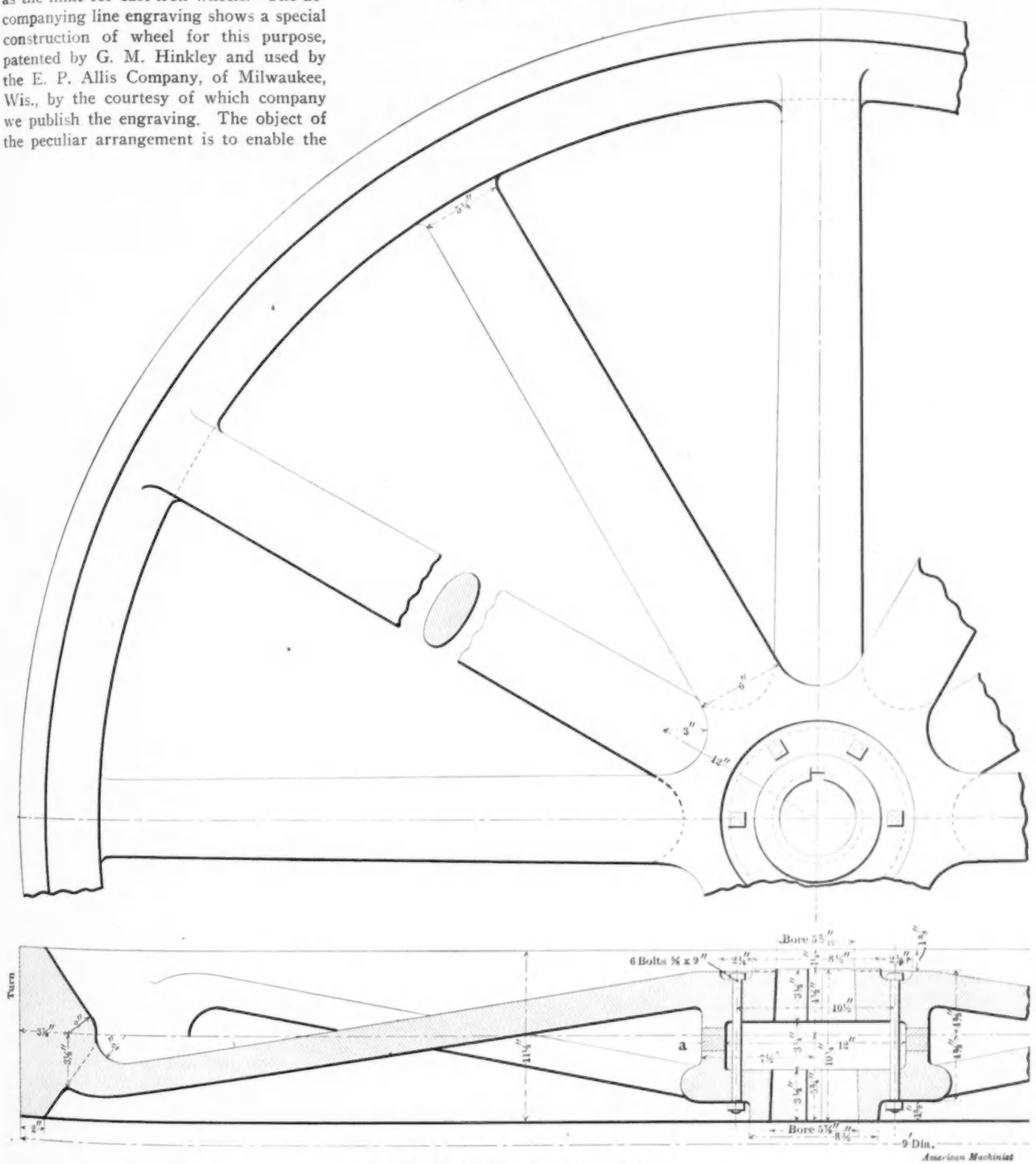
A partial remedy is to use the double-welt butt joint (Fig. 6), which, if of the following proportions—½-inch shell, 5-16 inch inside, 7-16 inch outside welts, the difference between the rigid part due to the joint and the flexible shell, will taper out in two steps of only about 33 per cent. differences. So long as the difference in the strength of this joint, over and above the single lap, is at least 20 per cent., it would seem that engineers would insist upon it. The point is not so much that it is a stronger joint to stand the hydrostatic test, as it is that it is less likely to lead to these concealed fractures, that no man can discover until it is too late.

A boiler with such a joint of 7-16-inch steel would be as strong as one with a lapped joint of ½-inch steel, and probably would cost no more; but here again competitors and purchasers come in—the one claiming that he furnishes a boiler with ½-inch shell, whereas the other man's is but 7-16, and the purchaser cannot be made to believe that the thinner one is the better of the two.

The Japanese bronzes contain a large percentage of lead. The following are the proportions of three of the modern Japanese bronzes: (1) Copper, 81.62 per cent.; tin, 4.61 per cent.; lead, 10.21 per cent. (2) Copper, 76.60; tin, 4.38; zinc, 6.53; lead, 11.88. (3) Copper, 88.55; tin, 2.42; zinc, 3.20; and lead, 4.72 per cent. Sometimes a little antimony is added just before casting.

A Cast Iron Wheel for High Speeds.

In laying out a band-saw mill it is not possible to limit the speed of the wheels to the traditional 100 feet per second, which, in many quarters, has come to be accepted as the limit for cast-iron wheels. The accompanying line engraving shows a special construction of wheel for this purpose, patented by G. M. Hinkley and used by the E. P. Allis Company, of Milwaukee, Wis., by the courtesy of which company we publish the engraving. The object of the peculiar arrangement is to enable the wheel to relieve itself of shrinkage strains in cooling and thus permit high speeds with safety. The arms will be seen to be arranged diagonally and to pass from one side of the wheel rim to the opposite end of the hub, alternate arms being staggered with one another. As first cast, the hub is in two pieces, the central portion marked *a* being vacant. After the wheel has become entirely cold, this space is filled by pouring in molten iron. As poured, the ends of the hub are separated by a core ⅝ inch thick, but the shrinkage of the rim compresses the arms and increases this space to about 1½ inches. After pouring the central portion, the ends are fastened together with bolts having the ends riveted over.



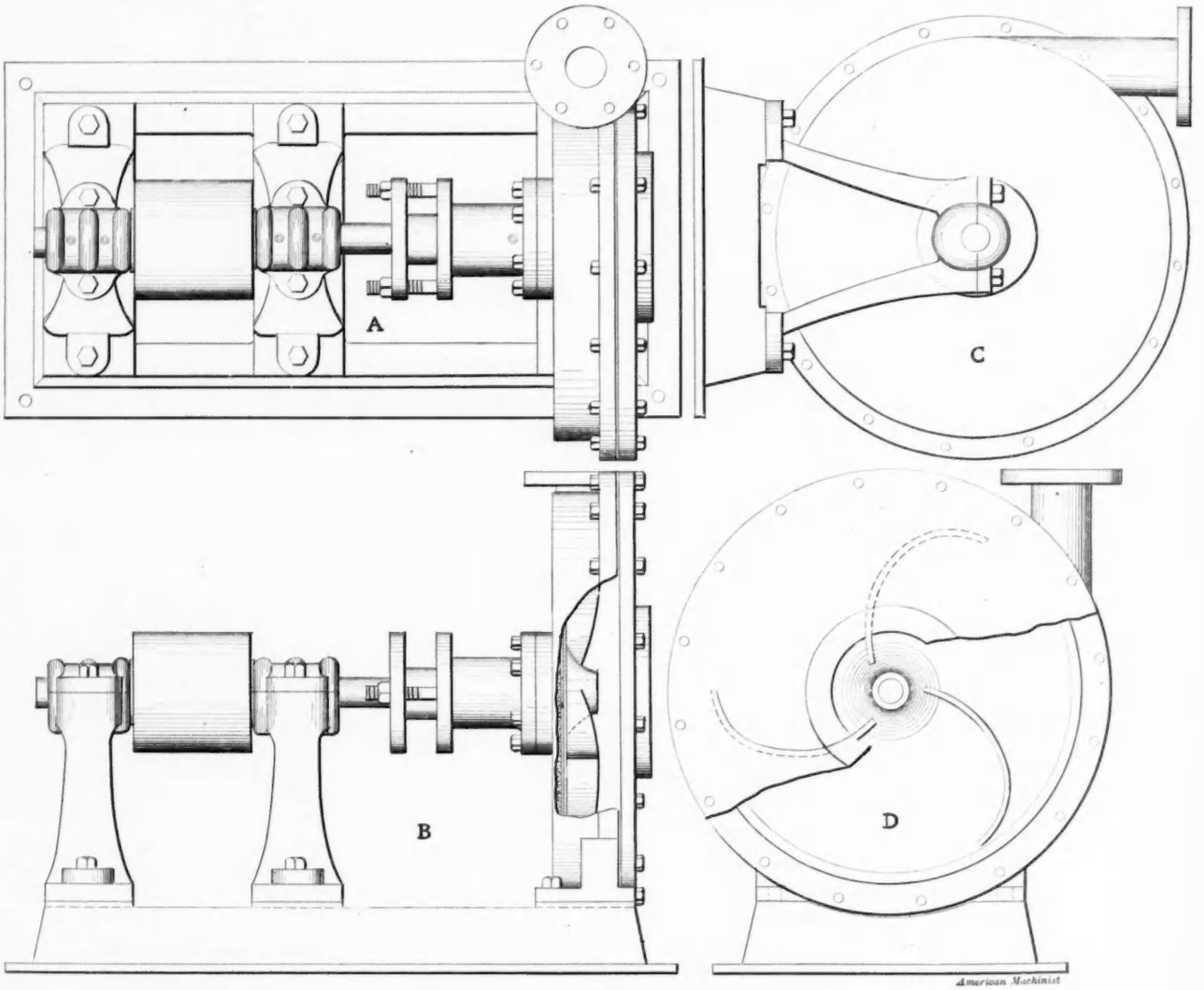
A CAST-IRON WHEEL FOR HIGH SPEEDS.

These wheels are made of 8, 9 and 10 feet diameter, the 8-foot wheels having weights ranging between 5,000 and 8,000 pounds, the 9-foot wheels between 6,000 and 10,000 pounds, and the 10-foot wheels between 10,000 and 12,000 pounds. They are regularly driven at speeds of 10,000 feet per minute, and have in some instances been run up to 12,000 feet. About 300 of them are in use, and the first one is yet to give way.

A Simple Centrifugal Pump.

The cut shows a centrifugal pump designed by James H. Adams, foreman machinist of the Forest Paper Company, Yar-

mouthville, Me.; *A* being a plan of the pump complete, *B* a side elevation, with a portion of the pump chamber broken away showing the fan blades within; *C* a view of the pillow block and pulley end, and *D* of the pump end, this also being broken to show the curve of the blades and the central hub. The pump seems to be so simple as scarcely to admit of any description. The discharge is through the vertical pipe above and the admission at the center of the chamber. In *B* is shown the edge of a thin disk to which the blades are attached, the entire fan being a single casting of composition. The disk has since been cut away and the fan is found to work better without it. The fan shown is not a large one, the pulley being 6x6 inches, the shaft 1½ inches, the outside diameter of the blades 17 inches and the greatest width 1⅞ inches. The discharge pipe is 2 inches, and the total length of the pump as shown is 32 inches. The company had experience with other makes of centrifugal pumps before adopting this. It is used for hot and cold water, caustic soda liquor, wood pulp, bleached and unbleached, and for everything about the mill where it is required to elevate or propel a liquid. A special advantage which it is claimed to possess over other pumps is in the ease and celerity with which it can be taken apart and put together.



CENTRIFUGAL PUMP FOR PAPER STOCK, ETC.

Letters from Practical Men

Some Continental Notes.

Editor American Machinist:

The editorial, "A Bit of Foreign Experience," in the "American Machinist" of January 18, was to me highly interesting, bringing back to my mind, as it did, many continental experiences of my own. Many of my friends find it hard to realize that in continental shops certain conditions are found which are entirely different from anything we see here. Not only shop methods, but social relations between employers and employees, are, in many instances, so utterly unlike conditions usually met with in our own shops that they can hardly be understood without personal experience. In most of the shops I have worked in here the relations between management and men have been pleasant, and I have seen very little exhibition of any feeling because of difference in rank. On the other side of the water I have seen much of an altogether different feeling, and a wide difference between heads of establishments and workmen to which we are unaccustomed in America.

As there are in all countries good and bad workmen, so there are agreeable and disagreeable managers. But I have seen few instances in foreign shops where there was anything like a feeling of equality between all classes, and where ordinary employees were considered of much account.

Some years ago I had the opportunity of installing a plant of machinery in a continental town, and I was not long in discovering the altogether different standing of workmen in America and of workmen abroad. In this particular establishment two men were associated in the management, and one of them—and, by the way, the mechanical one—was all that could be desired in his treatment of the workmen. His associate was exactly opposite in his manner and bearing towards the employees, and I think was about as disagreeable a person as I have ever been un-

fortunate enough to see much of. His arrogant and overbearing manner made him as heartily disliked as his partner was liked, and it hardly need be pointed out which one commanded the respect of his workmen and acquaintances.

It was in this town that I first learned of the custom of men saluting each other by raising the hat. It seems rather queer at first, but is a habit readily acquired. However, it looked entirely unnecessary for men working in the shop to be obliged to lift their hats or caps upon the approach of a superior. This seems like carrying a custom altogether too far; but I know from experience that it is a custom prevailing in many continental shops, and presume it is a characteristic of most of them.

Some time later I went to another part of the continent to install some more American machinery, and found that, though in another country, conditions in machine shops were very similar to what I had found farther north. There were quite a large number of automatic machines at this shop, and I undertook to get these running before starting the rest of the plant. I had some worthy assistants—natives—and we had many interesting episodes, as I could only say "Yes" and "No" in their language, and seldom knew when to use either, and consequently had to give all instructions through an interpreter.

The shop was a new one and had most primitive arrangements for heating and ventilating. The heating was accomplished by putting wood or coal into an open iron basket and, after lighting, letting it fill the whole room with smoke or gas, with now and then a little heat which could be felt fully 6 feet away from its source. There was little opportunity for keeping the air fit for breathing, and on cold days we had to take our choice between freezing and suffocating. The lard oil in the machines was solid for an hour or two each morning. These heaters were nuisances in other ways, as I discovered one day, when I made a sudden move for the engine room and came full tilt against one of these iron affairs full of red-hot coals; we went over together on to the cement floor, and I came near having coals of fire heaped on my head literally, as well as on other parts of my person. I fear I cut anything but a dignified figure, and a merry laugh accompanied the performance. As no especial damage was done, I could readily overlook the mirth provoked by the accident; but I have had ever since a healthy dislike for such methods of heating machine shops.

One day I needed some vise work done, and was offered the services of an alleged tool-maker from another department. He proved to be a fair vise hand, and as we were to have a tool room in connection with the new shop, I decided to keep him busy until such time as he could be of service in the new tool room. In an evil moment I set him to looking after some of the automatics then in operation. The man had orders not to interfere with any of the machines or tools in any way until they were acquainted with their operation; but this particular man seemed to have a craze for investigation—quite a praiseworthy desire often, but in this instance deplorable, as he had apparently no ability whatever for investigating in a practical manner, but would loosen up setscrews and alter tool adjustments indiscriminately whenever he thought he could do so unobserved. But one day he overreached himself, getting so much of a machine dissected that he could not reassemble it, and being caught in the act—red-handed, as it were—could only shrug his shoulders and wave his hands in an eloquent manner as he was invited to move on.

Another skilled workman that we had on this same job stood calmly watching a machine on which a cam had slipped, allowing the stock to run backward against a tool, and although a good deal of the tool was worn away before someone else stopped the machine, this bright man failed to realize that there was anything wrong until it was pointed out to him. We had lots of this kind of help about the shop, and it needed a great deal of watching. After a considerable length of time and a generous weeding out, we had a pretty good gang of workmen; and one of them, the youngest at that, became a remarkably good man, especially on automatic work, and was eventually placed in charge of one of the departments. All that he had needed was a little opportunity to show his ability; when the chance came he proved himself a first-class man.

One trouble that we experienced a little later on in this place was, a great difficulty in getting any special tools made, and in having repair jobs done in anything like a reasonable length of time. Any work that was out of the regular order seemed beyond the grasp of the majority of tool-makers about the shop. Of the score or more at work in the tool room, I remember only two or three who could do a special job in what would be considered here a first-class manner.

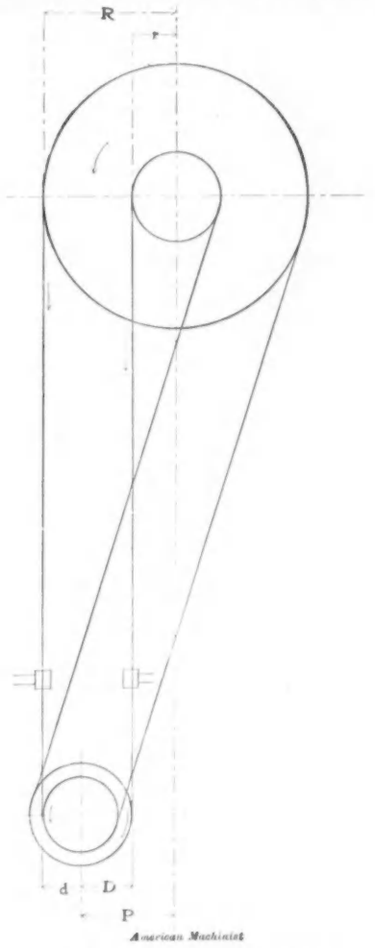
The proprietors of the shop were not particularly agreeable men to work for, and most of the workmen were, I judge from appearances, very much afraid of them. This was not strange, as I have seen one of the owners come into the shop and shout like a crazy man at one of the workmen over some very trifling circumstance that would not be noticed at all in any American shop. Although the managers had put in a most excellent plant of machinery, they attempted to economize on material, and from the looks of some of the steel they purchased, they must have searched for it far and wide. It was very peculiar in both shape and quality, and they made it worse by putting some laborers to work on it with sledges, with the idea of getting it straight enough to run in the machines. It never went through the automatics while I was there; and though that was some time ago, I am of the opinion that that lot of steel is still lying around somewhere, a monument to somebody's economical purchasing ability.

RANNALT F. KEYS.

Planer Countershaft Location.

Editor American Machinist:

A frequent source of trouble with shifting-belt planers is due to a faulty location of the countershaft, in such a way that the belts do not lead fairly through the shifter eyes and strike against either their front or back.



PLANER COUNTERSHAFT LOCATION.

The planer builder usually gives a foundation plan, and on this shows the proper location of the counter that will give the correct belt lead; the more careful ones go so far as to state that for each foot of the counter hight added to that shown on the plan the counter should be moved back a certain stated amount. This is all very well so long as it is heeded, but a much better way is to so arrange matters that the driving belts lead vertically through the shifter eyes, and to thus insure a proper lead quite independently of the hight the counter is placed above the machine.

This will be the case if the pulleys are

dimensioned in accordance with formulas 1 and 2.

$$r = \frac{(d + D)\,D}{cd - D} \qquad (1)$$

$$R = d + D + r \qquad (2)$$

The relative location of counter to machine will then be

$$P = R - d \qquad (3)$$

Notation—

r = radius of small pulley on counter;
R = radius of large pulley on counter;
d = radius of small pulley on machine;
D = radius of large pulley on machine;
P = horizontal distance between centers of counter and machine pulleys;
c = ratio: backing speed ÷ return speed.

A reference to the sketch will show the arrangement, and also serve to follow the considerations leading up to the formulas.

Inspection shows that if the driving sides of the belts are vertical,

$R = d + D + r$, and that (2)
$P = R - d$ (3)

But as the lower shaft speed when R drives d must equal c times the lower shaft speed, when r drives D, in order to get return to cutting speeds of ratio c, it follows that

$$c = \frac{R}{d}\,\frac{D}{r}$$

Substituting for R its value by equation (2) gives

$$c = (d + D + r)\,\frac{D}{d\,r}$$

and this by transposition gives

$$r = \frac{(d + D)\,D}{c\,d - D}$$

which is equation (1) above.

Taking a set of figures for trial with

$c = 4$, $d = 15$, $D = 20$.

By (1) $r = \dfrac{(15 + 20)\ 20}{(4 \times 15) - 20} = 17.5$.

By (2) $R = 15 + 20 + 17.5 = 52.5$.

By (3) $P = 52.5 - 15 = 37.5$.

The sketch has been drawn to scale with these figures, and shows that they are correct.

HENRY HESS.

Berlin.

Fixing a Steel Scale—A Boring Tool—Turning Collars.

Editor American Machinist:

I saw a man fix up an old graduated scale the other day in the most satisfactory and easiest manner possible. It was so old that the corners were all gone, as corners have a habit of wearing off. But he just put it in a surface grinder and ground both edges true in about ten minutes, when it was as good as new, or better, for you could read the graduations much easier.

I saw a boring tool which took about as good a chip as I've seen in a long time. It was nothing more than a wide, square-nosed tool with side clearance, ground as per sketch. Of course it can only be used on shallow holes, and won't stand much feed, but it takes a cut the full width of the tool.

We have a lathe in the shop which has no pipe center for the head spindle, but has one for the tailstock. Well, we had a lot of bushings to turn off that were not bored. The man got a chucking drill a little larger than the hole in the bushings, trued it up in the chuck, and was ready to do the job without the use of a dog, and without its being necessary to turn the

pieces around, the sharp cutting edges of the drill acting as drivers, making an actual saving of time over the usual way of using a pipe center and dog. A three or six fluted drill will do.

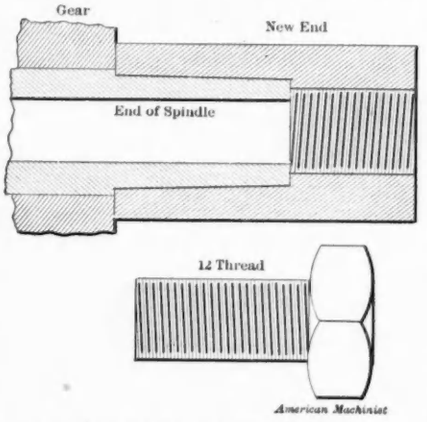
J. F. B.

Enlarging and Lengthening the End of a Lathe Spindle.

Editor American Machinist:

It is with a great deal of interest that I read the "Letters from Practical Men" in your practical paper. I have been looking them over with more than ordinary interest lately for an answer to the letter from Mr. Bright, of Decatur, Ill., in the issue of January 11, asking for suggestions as to the best way to repair his lathe spindle without making a new one. I did not answer sooner because I thought it very probable that there would be a good many better ways suggested than my own. Having seen nothing upon it, I will give my experience with just the kind of lathe spoken of.

The lathe is the only lathe in this tool room; it is 18 inches swing and has a ⅝-inch hole through the spindle. We also



ENLARGING AND LENGTHENING END OF LATHE SPINDLE.

have in the shop a very small lathe, which was too light to make a new spindle upon. The end bearing or journal of the tool room lathe got so short from running against the "step" and thrust screw that it interfered with the stability of the lathe. The bearing (see sketch) was about 1⅛ inches in diameter and only 1¾ inches long, half of which was inside the headstock casting, and the other half outside towards the cone. I took a piece of 1¾-inch round machinery steel 3 inches long and chucked it in the large lathe, bored a ¾-inch hole through it, then bored a taper hole into end outside of chuck 1¾ inches deep and 1⅛ inches in diameter in front end; taper had 2 degrees taper on each side of hole. I then cut a No. 12 thread through the ¾-inch hole, and took it out of the lathe. I then made a steel square-head screw to fit the No. 12 thread in the ¾-inch hole, to reach partly into the taper hole. I took the lathe spindle out and took the cone and gears off and put it into the little lathe and turned the end bearing to fit the taper hole in plug good. I drove the plug on up to the feed gear and screwed my square-head screw in the threaded hole and recentered spindle on head of screw; turned the plug off for the bearing, faced off the end for "step," took it out of the lathe and screwed in on square-head screw, thereby forcing the plug off the spindle with the end of screw against end of spindle. I put the cone and gears back on and drove the plug on in the same position it was when turned, and hid the screw so I can use it when I want to take off the cone again. I rebored the back box to fit the plug, put the lathe together, and it has been running steadily for a year since, doing better work than before, not having been repaired since. Mr. Bright could use as long a plug as he likes and arrange the thrust collars outside of the box on the end of plug or false bearing.

THEO LEITZ.

Punching Rig for a Lathe.

Editor American Machinist:

I send you a sketch, Fig. 1, of an attachment for punching sheet metal, etc., in a lathe, which I designed and made about four years ago. At that time I was employed by a cycle concern, and we were pushed pretty hard with our press work, while the prospects for getting additions to our equipment in this department were somewhat shady. We had a stiff Reed lathe of about 26 inches swing, and this device was fitted to it. It will be noticed from the sketch that there are no bending stresses transmitted to either the live or the tail spindles, the function of the live spindle being merely a rotative one.

The stroke decided on was 1 inch, and this was ample for the work to be done. The eccentric was steel and keyed on a piece of 2½-inch cold rolled shafting. On the end of the crank shaft nearest the live center a substantial cast-iron disk was fastened and a hardened tool-steel pin was shrunk in. At the same radius in the faceplate furnished with the lathe we inserted a bushing to which a plunger was fitted. On the back of the faceplate and at the end of the plunger mentioned a rectangular piece of tool steel was fastened.

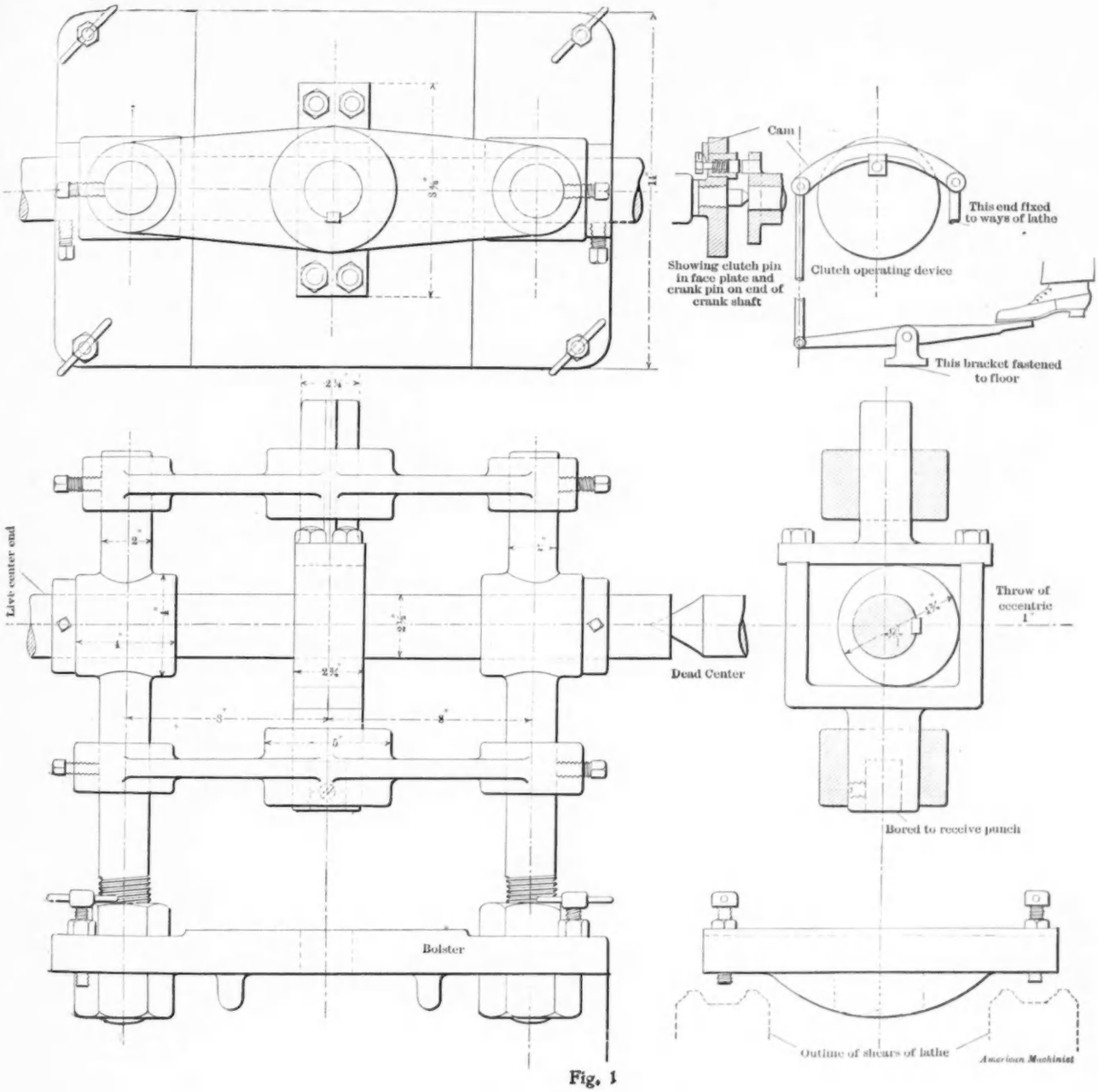

Cam
This end fixed to ways of lathe
Showing clutch pin in face plate and crank pin on end of crank shaft
Clutch operating device
This bracket fastened to floor
Live center end
Dead Center
Throw of eccentric
Bored to receive punch
Bolster
Outline of shears of lathe
American Machinist

Fig. 1

A PUNCHING RIG FOR A LATHE.

piece had an incline on the side next to the faceplate, and if the cam was raised by the foot, as shown, the punch would descend. If, however, the lathe ran continuously and the cam was not raised, it would wedge the plunger back and hold it until it got by the pin on the crank shaft, thus rendering the punch inoperative. The cam is a piece of ½x1½-inch bar iron, bent to a curve, and a hole drilled in each end, one being connected to the foot lever rod and the other end attached to a rod clamped to the lathe shears. One edge of the cam was beveled, to push the plunger endwise when not raised. This is a comparatively crude tripping device, but it worked well.

The adjustment of the punch to the die in a vertical direction was obtained by slackening the large nuts on the standards or uprights and positioning to suit. The four screws on the corners of the bolster plate were just brought into contact with the bed of the lathe after all adjustments were made to prevent any tendency to rotate. No doubt there are lots of small and medium size shops that have occasional jobs of punching, which will hardly warrant the installation of a press; such a device as herein described will to those so situated prove useful.

In connection with this it may not be amiss to show a multiple punch and die for bicycle rim washers which we used a great deal on the foregoing attachment, see Fig. 2. There were nine punches and nine openings in the die in the combination, making three distinct operations and turning out three washers at each stroke. The stock used was about .025 inch thick, and the finished piece as it left the die was as shown.

The first operation punched the center hole and formed the concavity to fit the head of the spoke nipple. The second operation sheared the triangular shaped ears, and a little of the circular part besides. The third operation completed the shearing, pushed the washer through the die and bent the ears up in so doing, the grooves in the punch allowing room for them while descending. The dies for the first operation were made separate, being merely bushings and driven home after the main body of the die was hardened.

Easton, Pa. EDMUND BURY.

Crank Pins for Large Engines.

Editor American Machinist:

I have read with some interest the letter of Mr. S. L. G. Knox, in your issue of March 15, 1900, under the above heading. He is quite correct in his opinion that revolutions per minute should be taken into account as one of the factors in estimating the sizes of crank pins and main journals. John Bourne, of London, discussed that matter in his treatise, published in 1860, and which I regard to-day as a most valuable book on engine history and actual construction.

Bourne's rule is very complicated, involving journal surface, speed and pressure per square inch, as in Mr. Knox's calculation; but I now present a rule, never before in print, which recognizes all the speed and pressure conditions. Divide the maximum indicated horse-power of the connected cylinder by 10, and the result will be the sectional area of the crank pin in square inches. By algebra: $\frac{I.\ H.\ P.}{10} =$ square inches. If the diameter of the pin is equal to its length, the formula becomes $\sqrt{\frac{I.\ H.\ P.}{10}} =$ inches of length or diameter, which is a very good proportion.

An engine of 1,000 I. H. P. should have a pin 10 inches diameter and 10 inches long. If the revolutions be reduced one-half, the I. H. P. becomes 500, and the pin is reduced to 50 square inches, or 7×7 inches.

The common rule with designers of three-crank marine engines is to make the crank pins one-half the diameter of the high-pressure cylinder, and the high-pressure cylinder, if 16 inches diameter, may develop 500 I. H. P. Using 8 for a divisor gives us 64 square inches, and $\sqrt{64} = 8$ inches, which is the half diameter required. I would prefer the 8 for a divisor to the 10, which I first set up, the thumb rule not being bad, however it is tested.

Applying my rule with the divisor 10 to the earliest marine engine which I knew anything about, that of the "Michigan," on Lake Erie, designed by Mr. Copeland in 1843, and on which I served in 1861, as a young engineer along with Chief Melville, I get 300 H. P. for one cylinder, which gives 30 square inches section for the crank pin, which actually measured 5½x5½ inches.

Applying the same rule to one of Melville's new four-cylinder torpedo-boat engines of 4,000 H.-P., or 1,000 H.-P. for each crank, gives 100 square inches section, and the pin measures 8¼ inches diameter and 12 inches long = 100 square inches section.

The "Michigan's" engines are a pair of 36-inch cylinders and 8-foot stroke, with 25 or 30 revolutions per minute for her side wheels, and the torpedo boat will make 350 or 400 revolutions, so that my rule takes care of the slowest as well as the fastest.

One of Manning's engines at Manchester has a pin 10x10 inches and is 1,000 H.-P.

Maxim's engine, 180 H.-P., had two crank pins, 3x3 inches, on his flying machine, which, as I predicted, could not fly, in spite of all the brag made for it.

WILLIAM H. HARRISON.

Braintree, Mass.

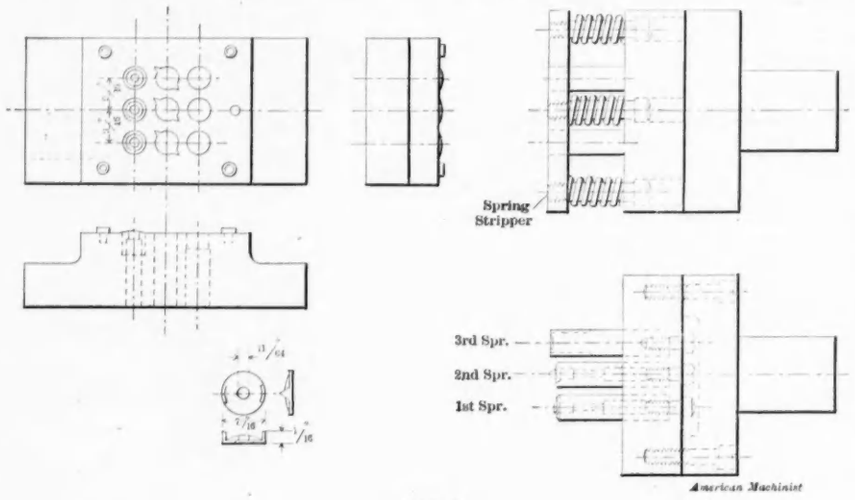


Fig. 2

SAMPLE OF PUNCHES AND WORK.

Personal.

R. H. Soule, M. E., member of the American Society of Mechanical Engineers and lately the Western representative of the Baldwin Locomotive Works, has opened an office at 71 Broadway, New York, as a consulting and designing mechanical engineer.

Col. Alex. Gordon, president of the Niles Tool Works Company, has returned from a trip through Russia and along a portion of the route of the new Siberian Railway, for which his company is furnishing large quantities of tools.

Death of James Dougherty.

James Dougherty, who may be considered one of the pioneer builders of modern American machine tools, died in Philadelphia May 10, eighty-five years old. Mr. Dougherty was born in Maryland, but went to Dayton, Ohio, in early youth and entered a foundry there. Later he spent some time in the foundry of Graham & Coon, at Cincinnati. At the age of twenty he was offered a position as manager of a foundry at Louisville. In 1837 he became superintendent of a foundry at Columbia, Pa. He invented and patented, about this time, a double plate car wheel, which was successful. In 1840 he was manager of Wolf's foundry in Philadelphia, where castings for locomotives were made, and in 1842 he was engaged by Norris & Co., locomotive builders, to erect and manage their foundry. The same firm then induced him to go to Vienna, Austria, to act as superintendent of its establishment there. While he was there the anchors for the large suspension bridge over the Danube at Pesth, Hungary, were cast. Mr. Dougherty, after a tour of Europe, returned to the United States in 1848 and commenced suit against infringers of his car-wheel patents, with such eminent counsel as Daniel Webster and Benjamin Curtis. The suit was successful, but the patent expired at about the same time. He next became manager of Merrick & Towne's foundry in Philadelphia and constructed the shipbuilding plant of Renney, Neafie & Co., now the Neafie & Levy Company. In 1853, with William B. Bement, he laid the foundation of the widely-known "Industrial Works" of Bement & Dougherty. In 1871, when the Industrial Works became known as Bement, Miles & Co., he retired from active business. During the civil war Mr. Dougherty raised a company from the employees of the Industrial Works, and he personally provided as needed for the families of its members until their return. In 1880 he made a trip around the world. We are indebted to the Philadelphia "Ledger" for the above particulars.

Fast Run of a Passenger Train.

On May 1, on the Chicago, Burlington & Quincy Railroad a fast run was made from Burlington to Chicago by a mail train consisting of the locomotive and four cars. The total distance was 205.8 miles, and the running time, deducting 14½ minutes for stops, was 188½ minutes, or at the rate of 65.5 miles per hour for the entire run. For 45 miles a mean speed of 73.6 miles per hour was recorded.

The Massachusetts Institute of Technology, Boston, Mass., announces its summer courses of study in mathematics, drawing, shop work, English composition, modern languages, chemistry, physics, surveying, architecture and geology.

Foreign Trade Notes.

GERMAN TRADERS READY TO JUMP AT SOUTH AFRICA.

On the strength of South African prospects after the war is over, immense quantities of goods, more particularly machinery, are being prepared for shipment thence from Germany. So hears Consul Geo. Sawter in Glauchau, Saxony. He writes that "the agents of several leading firms engaged in trade with which the Transvaal is peculiarly identified are proceeding out to Cape Town, to be able to give their principals the earliest information as to the position of affairs in the republics and their probable needs when the war is over. It is very generally believed that the settlement will be followed by a boom such as the world has not seen since the days of the gold discoveries in Australia." In the last ten years German trade with South Africa has grown very rapidly. The imports of German goods (covering just how much territory in South Africa is not stated) increased from $845,262 in 1891 to $6,154,369 in 1896, since which time there has been some falling off, as there has been in imports from other countries. It looks as though American manufacturers would have all they needed to do in holding up their end.

PORTO RICAN TARIFF.

Considerable misapprehension exists in the minds of most of our exporters and manufacturers as to the rates of duty collectable under the new tariff for Porto Rico, upon importations of merchandise from the United States, and, with a view to correcting these views, the Treasury Department has prepared a table covering all articles which will be affected, giving the correct rates on same. From that list it appears that the rate on cut nails is 9-10 of 1 mill per pound; on wire nails, 1½ mills per pound; steel bars, 9-10 of 1 mill per pound; while machinery for making and refining sugar, plows, hoes, machetes, hatchets and agricultural implements other than machinery, are all entitled to free entry, and in addition to these the entire free list of the Dingley bill.

OUTLOOK FOR MACHINERY IN CHINA.

The Chinese market is now attracting more public attention than almost any other because of the politico-commercial questions of the Far East now up for settlement. Under the general assumption that China opens an unlimited market for American wares, it is easy to assume that machinery man facturers will have their share. But is that assumption well founded? A lengthy communication on the possibilities of the Chinese market for various kinds of goods has just been sent in from Hongkong by Consul-General Wildman. He takes the position that, with some unimportant exceptions, there is no opening in China for machinery and tools, since hand labor is so cheap.

"What tools they have are very crude and are made locally at a small price, and there are no shops that make a business of dealing specially in them. The time has not yet arrived when foreign tools of any class can be introduced among the Chinese. Within the last year, an American firm made a shipment to Hongkong embracing a complete assortment of modern tools. They were accompanied by a representative. After coming here and testing the market in an intelligent way, he gave up the enterprise and reshipped all his tools to the United States. As I have said before, as long as labor remains at 10 cents a day, stones will be quarried, timber sawed, bricks made, piles driven and goods transported by hand. Machinery at present cannot compete with cheap labor, and the only tools that gain a footing on this coast are those of warfare, and even these are of the cheapest kind."

The view here taken may be unwarrantably pessimistic. Important installations of American electrical and other machinery have already been made in China and there is no reason why more should not be made in the near future. Mr. F. W. Horne, of Yokohama, when in this country last fall, stated that he was carrying on branches for the sale of American machinery and tools in several Chinese cities. Still, it would appear that this trade must be chiefly with Europeans in the Far East. It is likely that whatever immediate call for machinery there may be in the Empire will be a European and American demand transplanted in Oriental soil. It will be the product of Western enterprise. It will doubtless result sooner or later in changing the national characteristics as those of the Japanese have been changed. Among the first fruits of this transformation will be the numerous installation of electrical plants for lighting and railway purposes. But before this comes about and before there is enough machinery in use in China to require the equipment of frequent shops for its repair, American tool manufacturers need not expect to fill their works with orders from native Chinamen.

ELECTRICAL INSTALLATIONS ABROAD.

The blast furnaces of Villefranche du-Confluent (Pyrenées-Orientales) have been acquired by an electric light and power company, which will establish an electric plant there.

A proposed electric railway in Leicestershire, England, is the subject of a report from Nottingham by Consul S. C. McFarland, who thinks American manufacturers may be interested. The Brush Electrical Engineering Company, Limited, Falcon Works, Loughborough, is supporting the promotion.

Consul Barrleman sends from Malaga, Spain, the following list of suburban electric tramways for which concessions have been given: San Sebastian to Tolosa, Cadiz to San Fernando, Corunna to Bur-

(Continued on page 44.)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 20.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co., Meriden, Ct.

Punches & dies. Wal.M.Wks., Waltham, Mass.

Shaft g straighteners. J.H.Wells, Tampa, Fla.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas, Bridgeport, Ct. Send for index sheet.

Wanted—To purchase, complete drawings for six sizes of dough mixers. Address Baker, AMERICAN MACHINIST.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

1½ H.-P. gasoline engine, $75; castings and blueprints, $15. Christison & Jones, 399 Goodrich ave., St. Paul, Minn.

Estimates furnished on all kinds of castings; satisfaction guaranteed. Weatherly Foundry & Machine Co., Weatherly, Pa.

Wanted—A small second-hand metal planer for model or experimental work. Address, giving details and price, Box 21, AM. MACH.

Wanted—By the Patterson Tool & Supply Co. Dayton, Ohio, one 12 or 14-foot boring and turning mill; must be in first-class condition.

Wanted—Second-hand lathes, gas engines, drill presses, motors; state condition, price and name of maker. H. Bertrand, Box 27, Glen Ridge, N. J.

Wanted, Immediately—Standard gage locomotive, weighing about 20 to 27 tons; state price, condition, location; must be cheap for cash. Room 723, Reaper Block, Chicago, Ill.

For Sale—A double annealing and case-hardening furnace of Brown & Sharpe's latest pattern, in just as good order as when new; prices and terms very reasonable. Address Eclipse Bicycle Co., Elmira, N. Y.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Experienced draftsman and designer, technical graduate. Box 15, AMER. MACHINIST.

Designer of large experience; special and automatic machinery, jigs, tools, etc. Box 28, AMERICAN MACHINIST.

Mechanical and electrical draftsman, practical and theoretical experience, wishes position. Address Box 27, AMER. MACHINIST.

Steam engineer and millwright of experience and ability, wants position, mill or factory; economic methods. C. A., AM. MACH.

Wanted—Position as foreman, by first-class toolmaker and machinist; experienced on fine machinery, dynamos, tools; best references. Address Box 18, AMERICAN MACHINIST.

Experienced machine designer and toolmaker, technical, practical, ingenious and up to date wants a responsible position. Address "Michigan," AMERICAN MACHINIST.

A mechanical superintendent, with practical experience, executive and inventive ability and 15 years' successful management, is open to an engagement. Box 31, AM. MACH.

A competent mechanical draftsman and designer of general machinery and printing presses, experienced in shop and drawing room, is open for engagement. Box 26, AM. M.

German mechanical engineer, occupied in New York, experienced in American machinery, speaking French fluently, desires position at Paris Exposition. Address Box 33, AM. M.

(Continued on page 44.)

(*Continued from page 43.*)

gos de Santiago, and from Arriondas to Coradonga; also for tramways in the following cities (probably more than will be completed): Barcelona, Valencia, Seville, Saragossa, Corunna, San Sebastian, Cadiz, Oviedo, Almeria and Carthagena. The construction of 111 miles of steam railroads, chiefly narrow gage, was begun in Spain last year.

The city of Vladivostock, Siberia, is to have an electric lighting and 12-mile railway system as well as a water-works plant. This matter is the subject of a communication thence from Commercial Agent R. T. Greener to the State Department at Washington. He writes that no favoritism on the ground of nationality will be shown in the work. The new Russo-Chinese Bank in Vladivostock is constructed with American materials, including steel ceilings, steam fittings, electrical work, vaults, safes, wall paper and furniture. This has been brought about largely through the efforts of Mr. S. L. Epstein, one of the directors of the bank. Mr. Greener showed General Tchitchagoff, the military governor, some American circulars, catalogs and newspaper extracts bearing upon public improvements in the United States, and in reward was elected a member of the Statistical Society for the Amur and Maritime Provinces.

VARIOUS FOREIGN ENTERPRISES.

A new French engineering company, to be known as the Societé Anonyme Française, capitalized at $1,600,000, is to establish at Saint-Omer, on the canal d'Aire and railroad du Nord, works for the manufacture of boilers, railway material and other iron products. Employment will be given to 2,500 men, for the accommodation of whom 400 houses will immediately be put up. The engineer and manager of the enterprise is M. Eugene Leger.

Consul G. C. E. Weber reports from Nuremberg, Germany, that a general automobile exposition will be held in that city from June 1 to July 1, 1900, which will be very interesting, as showing what German automobile manufacturers have produced of late. Races to the neighboring cities of Würzburg, Kissingen, Bamberg, etc., will take place. Austria has sent some automobiles to this show. France, Belgium and England were too much engaged with the Paris Exposition. The most important feature will be, undoubtedly, the exhibits of the Schuckert electrical factory in Nuremberg.

Vice-Consul J. F. Monaghan writes from Chemnitz, Germany, that a company has been organized in that city, with a capital of $3,570,000, to build wagons, carriages, etc. This factory, he says, will furnish a great opportunity to our manufacturers of wagon and carriage tools and machines; also to makers of wood-working tools and machines.

(*Continued on page 45.*)

Situations Wanted—Cont'd.

Young man, some experience in drafting, 7 years' shop experience, 2½ years at Cornell Mechanical Engineering Course, desires position, drafting room, foreman or assistant in shop; any section of United States. Box 29, AMERICAN MACHINIST.

An experienced mechanical superintendent wants to make a change from present position; up to date on typewriter, phonograph and small interchangeable work; steady, sober; can furnish best reference. Address "Superintendent," AMERICAN MACHINIST.

A mechanical engineer, 43, broad experience, desires to make permanent arrangements to represent some house or houses on West Coast; has been a salesman, also contractor for machinery; can give good bond and references. Address F. H. Whiting, Tacoma, Wash.

A first-class draftsman, 4 years' shop experience, 4 years in drawing room (Junior, A. S. M. E.), desires a change; experienced on heavy mill machinery and automatic machine tools; would prefer situation as assistant to a master mechanic, or would accept a situation as draftsman. Box 30, AM. MACH.

Foreman desires position in charge of toolroom or machine shop; experienced on dies, jigs, fixtures, automatic machinery, sheet-metal work and interchangeable parts of machines or manufactured goods; energetic and thorough in his work, and systematic in shop management. For particulars and reference, address "Energy," care AMER. MACH.

Help Wanted.

Wanted—Two first-class, all-around machinists. Gifford Bros., Hudson, N. Y.

Wanted—Good mechanical draftsman for pump work; must be No. 1. Box 287, AM. M.

Wanted—Foreman, thoroughly experienced in the rolling, drop-forging and drawing of copper. Box 11, AMERICAN MACHINIST.

Wanted—Draftsmen on valves and hydrants; none but experienced men need apply. Address Box 25, AMER. MACHINIST.

Wanted—Toolmakers on tools for small interchangeable work; state age, experience and wages expected. Box 12, AMER. MACHINIST.

Wanted—A mechanical draftsman to design copper and brass rolling and drawing machinery; a technical graduate preferred. Box 24, AMERICAN MACHINIST.

Wanted—Machinists for vise work, preferably with experience in building presses and other tools for sheet metals. Niagara Machine & Tool Works, Buffalo, N. Y.

Wanted—Draftsmen in our machine shop, who have experience in designing special tools, jigs, etc. Automobile Company of America, Marion, Jersey City, N. J.

Foundry Foreman—A competent and experienced foreman wanted to take charge of foundry making Corliss engines. Address the C. & G. Cooper Co., Mt. Vernon, Ohio.

Molders—Wanted, four first-class loam and green sand molders; reliable men only; non-union preferred; highest wages. Address, with full particulars, Box C, Saltville, Va.

Wanted—Two good all-round machinists accustomed to new work and repairs; a steady job for competent, reliable men. Western Cane Seating Co., Michigan City, Ind.

Wanted—Man to take charge of planers, medium heavy and light work; state age and nationality; must be a first-class workman. Address Box 338, AMERICAN MACHINIST.

Wanted—Foundry foreman, shop specialty being power transmission; one accustomed to molding machines preferred; state age and references. Box 32, AMERICAN MACHINIST.

Wanted—Three or four good toolmakers on light machine work. New Jersey shop; state age, experience and wages expected; steady work. Address "Jersey," AMER. MACHINIST.

Wanted—A practical machinist, in Chicago, capable of manufacturing with economy a large number of 4 H.-P. gasoline engines. Address "Automobile," care AMER. MACHINIST.

Wanted—A competent draftsman who has had extensive experience in designing jigs and fixtures for duplicate work; good position for first-class man. Address Box 2,023, Bridgeport, Conn.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—Man able to take charge of a department in machine works making mill machinery; must be a thorough machinist and toolmaker and know how to handle unskilled help; state age, experience and references. Box 337, AMERICAN MACHINIST.

Wanted—A number of first-class iron molders; men who want to enter the employment of a company who believe in fair play and free labor; none but strictly temperate men need apply; steady work and good wages. Brown & Sharpe Mfg. Co., Providence, R. I.

Wanted—A thoroughly competent foreman, who has had experience in the manufacture of small gasoline or gas engines, and who is familiar with modern economical methods of manufacturing; excellent opportunity for the right man. Address Box 2,023, Bridgeport, Conn.

We can use on heavy boring machines, planers and large lathes several first-class machinists who can and will make these machines do all they were designed to do; unless you can earn 30 or more cents per hour do not apply. Gates Iron Works, 650 Elston ave., Chicago.

Wanted—First-class, experienced draftsmen on high-grade interchangeable machinery, also toolmakers or A No. 1 machinists for our drafting room, capable of designing first-class tools and fixtures. United Shoe Machinery Company, McKay Department Factory, Winchester, Mass.

PRESSES, DIES AND OTHER
SHEET-METAL TOOLS
FERRACUTE MACHINE CO.
BRIDGETON, N. J.

CLEVELAND GEAR WORKS
W. R. SAWYER, Lessee.
86 Seneca Street,
CLEVELAND, OHIO.
Gear Wheels and Gear Cutting
of all descriptions.
Get Our Prices.

FOR SALE.
CORLISS ENGINE.
Cylinder 30 in. x 60 in.; shaft 11 in.; wheel 18 ft. in diameter x 44 in. face.
This Engine is in first-class condition, and can be seen at the works of this company in Chicago.
McCormick Harvesting Machine Company,
CHICAGO, ILL.

HYDRAULIC
JACKS
Tube Expanders,
Hydraulic Punches,
Screw Punches.
A. L. HENDERER'S SONS,
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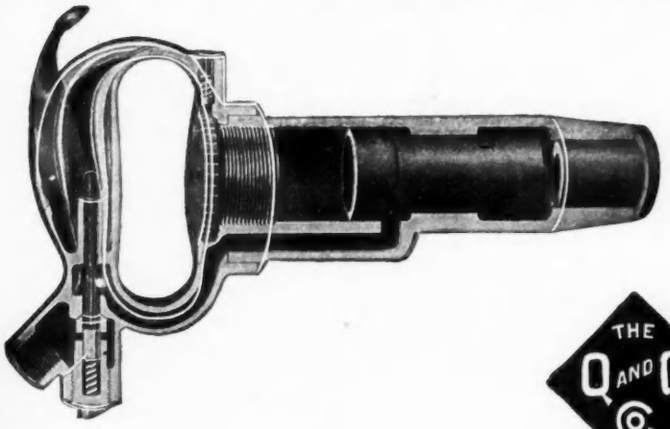
New York Gear Works.
Gears cut to 90" dia.
Machine work of all kinds.
57 Milton St., Brooklyn, N. Y.

BEING "ON THE INSIDE,"



THE Q AND C

One is apt to see lots of things, but our Pneumatic Hammers disclose few things and infinite possibilites.

Note the neat and simple construction throughout and then know that this Hammer will do more work for its size, with less air and less vibration, than any other tool.

MADE IN FOUR SIZES.

We make some Drills, Riveters and Hoists that will save you time and money.
When ordering send for tool on trial.

THE Q & C CO.

CHICAGO. NEW YORK.

Schofield's Steel Frame

Bi-Treadle Emery Wheel

Is especially adapted for use in Machine Shops and Bicycle Repair Shops, as it will grind anything that can be ground on a grindstone, and is warranted to *grind faster* with *less labor* than any other foot power emery wheel on the market, and is sold for less money.

Schofield & Co.,

Mfrs., 19 Adams St., FREEPORT, ILL.

HINDLEY WORM GEARING.

MORSE, WILLIAMS & CO.,

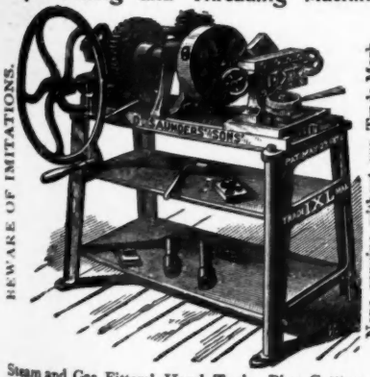
PHILADELPHIA, PA.

D. SAUNDERS' SONS,

Manufacturers of the Original

TRADE I. X. L. MARK.

Pipe Cutting and Threading Machine.



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Steam and Gas Fitters' Hand Tools, Pipe Cutting and Threading Machines for Pipe Mill use a specialty.

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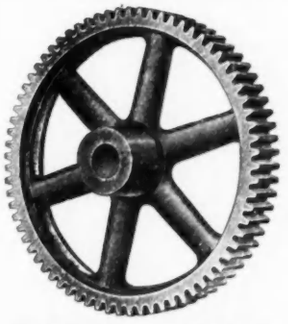

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We cut 3,200 sizes of Spur, Bevel, Spiral, Worm, Sprocket, Rack, Elliptic and Internal Gears. We do nothing else but cut gears. If we haven't the gear you want, we'll make it. Write to-day for Catalog K.

BOSTON GEAR WORKS,

Pearl and Purchase Sts.,
BOSTON, Mass.

(Continued from page 44.)

MACHINERY OPPORTUNITIES IN GERMANY AND AUSTRIA.

The following is a list of some new enterprises selected and translated from those published in the "Deutsche Metall-Industrie-Zeitung." The firm of Fried. Treppmann, Dortmund, Prussia, proposes to erect a tool factory. The Oesterreichische Waffenfabrik (Austrian Arms Factory), Vienna, since the prospects in the bicycle making line are not favorable, proposes to manufacture fine tools instead. The machine shop of Podvicini & Heisler, Budapest, Hungary, has been destroyed by fire. The Rote Erde Iron Works at Dortmund are erecting a new rolling mill, to be ready by fall. The Oberschlesiche Eisenindustrie Aktien-Gesellschaft für Bergbau und Hüttenbetrieb is issuing over $1,000,000 additional stock in order to put up a new steel and rolling mill plant at the Julienhütte, in Bobrek, Upper Silesia. The Schwelmer Eisenwerk, in Schwelm, Prussia, has been incorporated for the purpose of making important extensions. The firm Dr. A. Lessing, of Glaishammer, Germany, expects to put up a new factory for electrical apparatus. J. Pohlig, Drahtseilbahnen-Fabrik, Cologne, will install a wire plant in Bergdorf, near Brühl, Rhenish Prussia. The Braunschweiger Maschinenfabrik Aktien-Gesellschaft, Brunswick, has increased its capital for the extension of its work. The Aktien-Gesellschaft Neuerburgs Maschinenfabrik, in Kalk, Rhenish Prussia, opposite Cologne, is making important extensions. Johann Georg Dorn & Co., Nuremburg, intend to erect a bronze stamping mill, with thirty-four stamps. The workshop of the school of machinery and electricity in Ansbach is to be enlarged at a cost of over $20,000. To the machine shop and foundry of G. Sauerbrey, in Stassfurt, Prussia, will be added a boiler shop, etc. The Zeitzer Eisengeisserei und Maschinenbau Actien-Gesellschaft, in Zeitz, Prussia, is planning to erect a new boiler shop and extend its Ehrenfeld works. The Victoria-Werke Actien-Gesellschaft, in Nuremburg, proposes to enter the manufacture of automobiles and other lines. The Alfred Gutmann Company, Ottensen, Prussia, proposes to increase its capital to extend its facilities. A forge shop for smith work is under contemplation by Felix Flemming, Kolnerstrasze 9, Greuenbroich.

New Catalogs.

The Standard Tool Company, Cleveland, O., has issued a catalog, printed in English, French and German, running in parallel sentences and paragraphs. It is devoted to twist drills, reamers, chucks, taps, milling cutters, etc. Size, standard, 6x9 inches.

The Rahn-Mayer-Carpenter Company, Cincinnati, O., sends its catalog containing illustrations and brief descriptions of its engine and turret lathes. On page 19 the special features of this line of lathes are pointed out in detail. Size, standard, 6x9 inches.

We have received from the Q & C Company, Chicago and New York, a pamphlet illustrating and describing the Torrey ballast car, a system for loading and distributing gravel and rock ballast, with an announcement that they are prepared to grant licenses to railway companies or contractors to manufacture or use such cars. Size, 9x6 inches, standard.

The Chisholm & Moore Manufacturing Company, Cleveland, O., sends its catalog of quite a variety of apparatus. This includes, in part, differential chain hoists, geared hoists with pneumatic motor, pneumatic drum hoists, traveling cranes, pneumatic riveters and drills, door hangers and locks, rail joints and other fittings. In the back are some engineering tables. Size is 6x9 inches, standard.

We have received from August Mietz, 128-138 Mott street, New York, a catalog of the Mietz & Weiss engine operated by gas or kerosene. Applications of these engines for various power purposes, direct-connected dynamo driving, etc., are illustrated, and there are some line drawings showing their method of lubrication and other features of construction. Size, standard, 9x6 inches.

The Garvin Machine Company has issued a new edition of its catalog, similar in style to the last one, but with more in it. The tools constructed by the company include universal and plain milling machines, screw machines, monitor lathes, hand lathes, chucking lathes, tapping machines, drill presses, cutter grinders, forming machines, gear cutters, profilers, etc., besides special labor-saving machines for bicycle and automobile construction, etc. Size, 4¼x6¼ inches.

The Bickford Drill & Tool Company's new catalog of its drilling machinery and other tools is the result of considerable pains and ingenuity in some of its features. In its endeavors to give the book an attractive appearance the company has not been content with the use of superfine illustrations and paper, but has so far as possible constructed the paragraphs on each page so that they naturally fall inversely in order of their length, or "size up," as printers express it. The code system is so arranged that its words begin with a different letter for each size of radial drill and change their second letter with each style. A special method is provided for designating the combination of heads, rail and housings desired in ordering a multiple drill, and there is a clever code table for designating numerical amounts. It is of standard size, 6x9 inches.

Manufacturers.

J. G. Taite's Sons, Philadelphia, Pa., manufacturers of tinware, will have an addition built to their factory.

The Electric Storage Battery Company, Nineteenth street and Allegheny avenue, Philadelphia, Pa., will have a new building erected.

Merchant & Co., Incorporated, importers and workers of tin plate, will add to their power-house, Twentieth street and Washington avenue, Philadelphia, Pa.

The Columbia Jewelry Company will commence work at once on the erection of a one-story brick factory on Camp street, near Cambridge avenue, West Somerville, Mass.

John E. Lonergan, brass founder and finisher, is having a four-story store and factory building, 23x113 feet, erected at 217 Race street, Philadelphia, Pa., by S. R. Riley.

Laird Schober & Co., shoe manufacturers, are to have a four-story building, 47x39 feet, erected at Nineteenth and Buttonwood streets, Philadelphia, Pa. W. R. Dougherty is receiving bids.

(*Continued on page* 47.)

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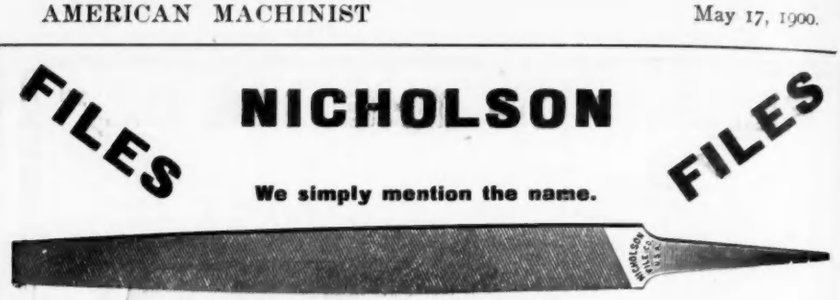
We simply mention the name.



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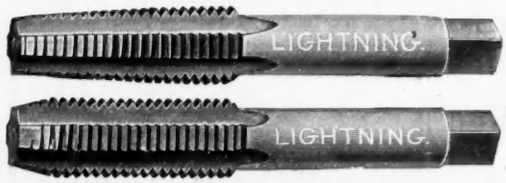

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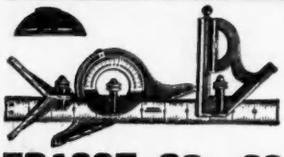

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